INDUSTRIAL ARTS and VOCATIONAL EDUCATION

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No. 3

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THIS MONTH'S COVER

For our cover picture this month, we have chosen the splendid picture which President Roosevelt had made of himself and which he inscribed for the pupils and teachers of the country at the request of United States Commissioner Studebaker.

The photograph has been carefully reproduced by the United States Office of Education so that excellent duplicates on heavy paper are available for framing and for use on school walls.

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DATES TO BE REMEMBERED

National Vocational Guidance Association Convention, Atlantic City, N. J., February 20–23.

South Eastern Arts Association Convention, Charleston, S. C., March 14–16.

Indiana Industrial Education Association, Terre Haute, Ind., March 29–30.

Western Arts Association Convention, Chicago, Ill., April 3–6.

Eastern Arts Association Convention, Philadelphia, Pa., April 10–13.

Illinois Vocational Association Convention, Champaign, Ill., April 19–20.

Michigan Industrial Education Association Convention, Dearborn, Mich., April 25–27.

IN THIS ISSUE

Those interested in the practices used by industrial-arts teachers throughout the country will, no doubt, find M. E. Warner's study on page 69 of this issue both instructive and interesting. The editorial on page 81 may be enlightening to some teachers of industrial arts and vocational education.

Articles Indexed—The articles contained in the Magazine are regularly indexed in "The Reader's Guide to Periodical Literature." and "Education Index."

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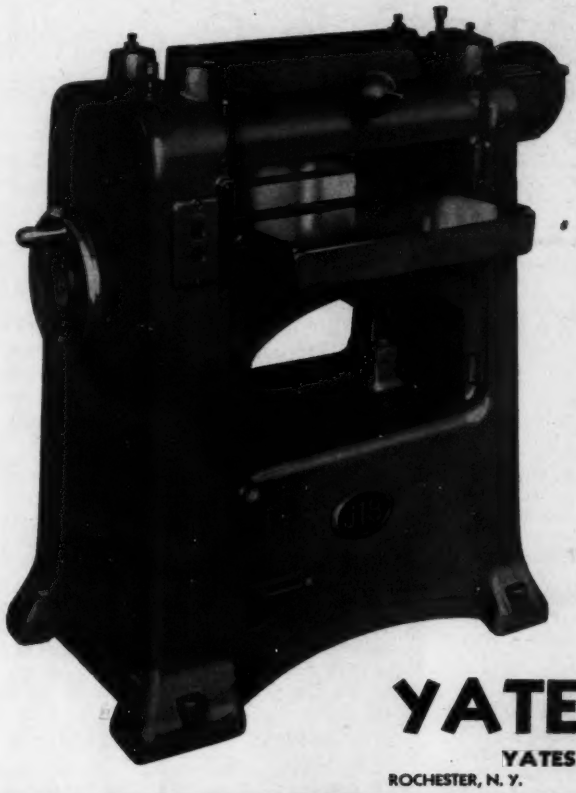

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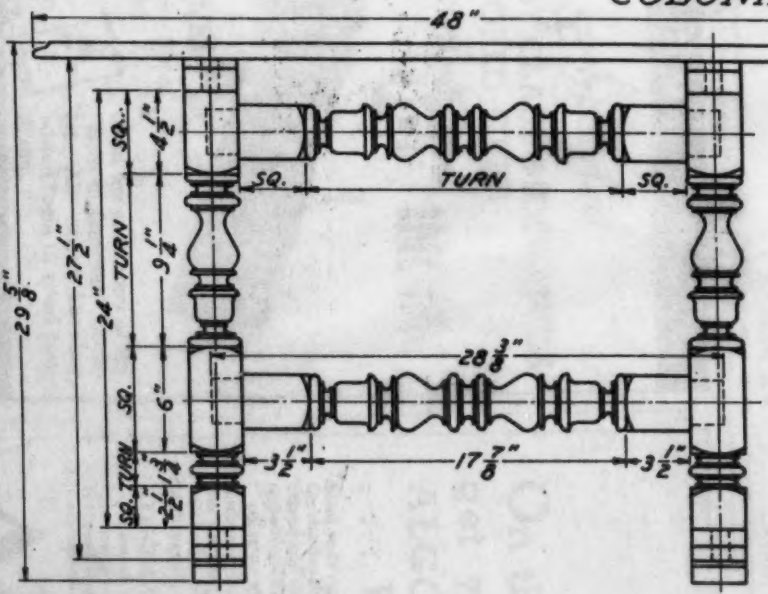
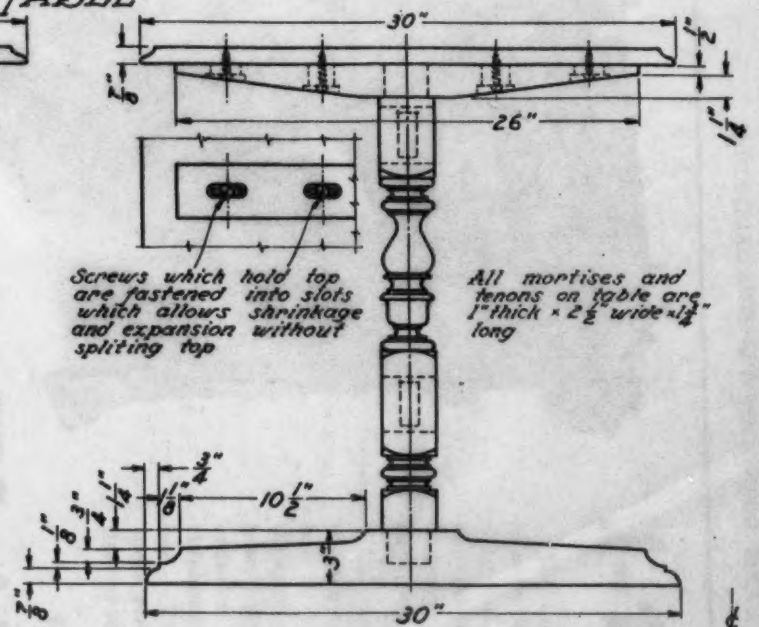
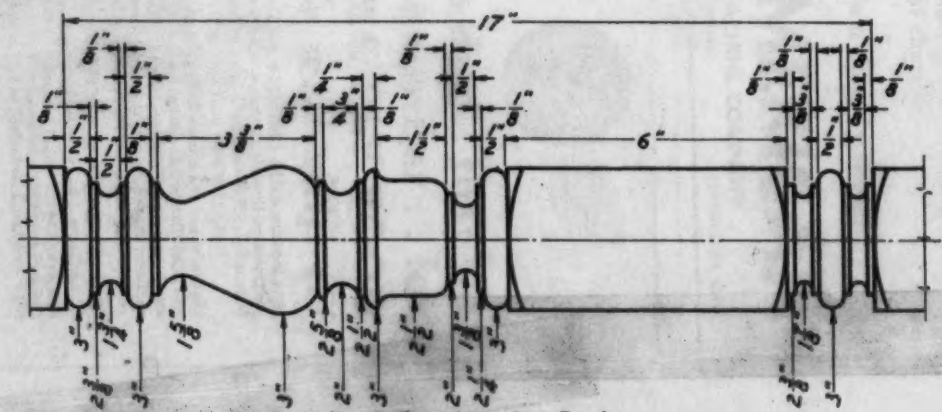
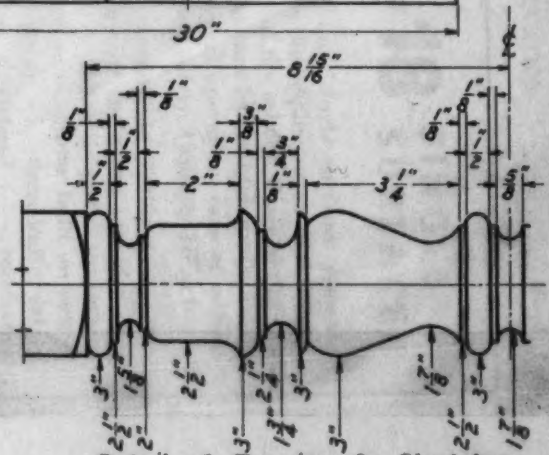






Detail of Turning for Posts
Total length 27 1/2"



Detail of Turning for Stretcher
Total length 28 3/8"

I.A.V.E.

Designed by Franklin H. Gottshall, Scotch Plains, New Jersey

(This article is continued on page 89)

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(This article is continued on page 89)

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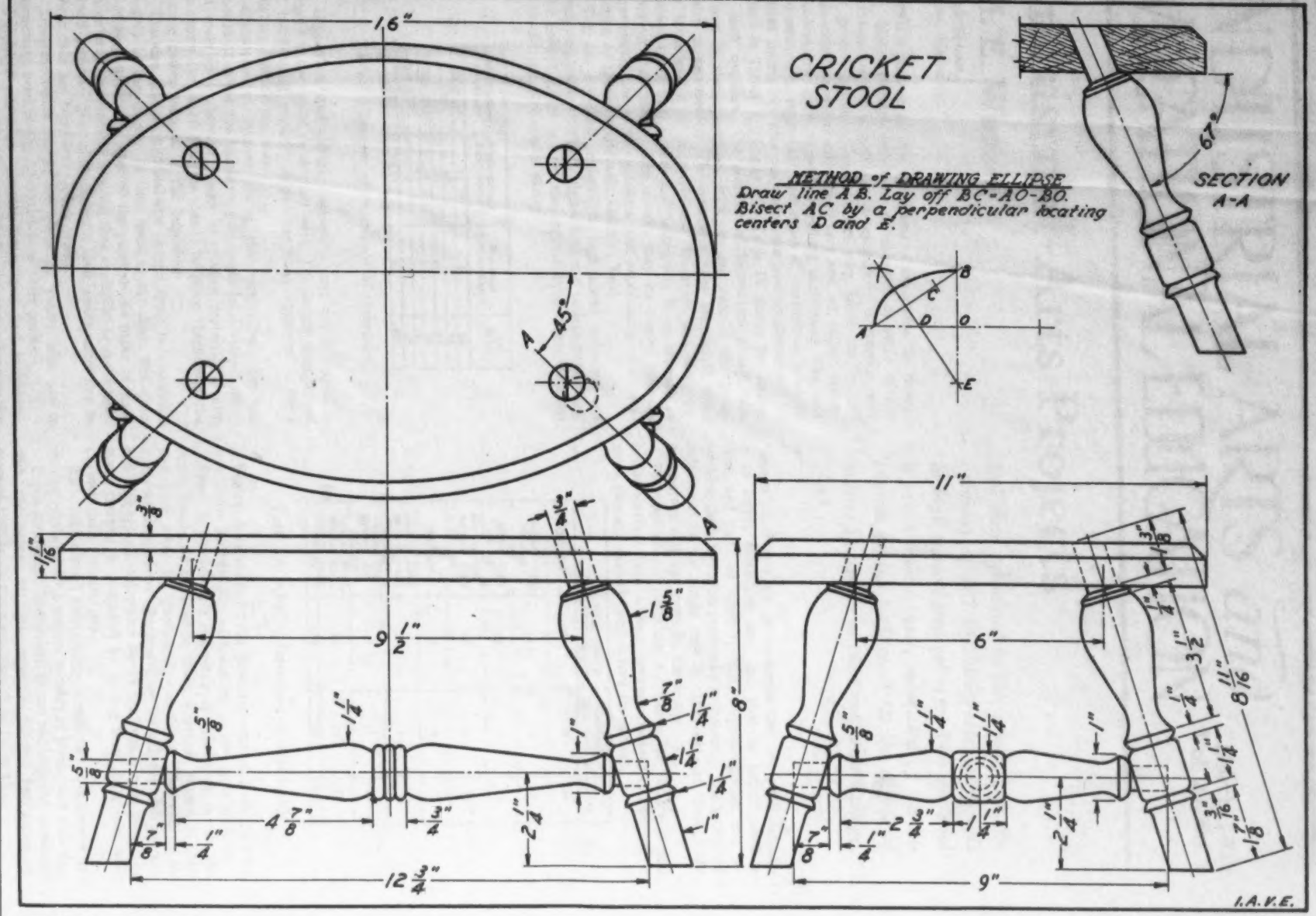

I.A.V.E.

Designed by Howard V. Patterson, Merriam, Kansas

(This article is continued on page 89)

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

March, 1935
Vol. 24, No. 3

Industrial-Arts Projects

M. E. Warner

High School,
Brule, Nebraska

The data contained in this article give the opinions of 203 industrial-arts instructors in high schools and colleges. This material is taken from a thesis submitted by the author in partial fulfillment for the degree of master of science at the Iowa State College, 1933.

THE purpose of this study was to determine the desirability, through consensus of opinion, of some of the practices used by industrial-arts teachers in connection with the project method. Questionnaires were filled out by 140 high-school industrial-arts instructors and 63 college industrial-arts instructors in teacher-training institutions. The kind and amount of experience, and types of institutions in which college instructors who responded are now employed will be found in Tables I, II, and III. Table IV shows the results of each question. The number of instructors giving each answer is shown together with the per cent of the group which is represented. The questions were formulated after an investigation of industrial-arts literature and were examined by several experienced instructors in an attempt to improve the validity. The results may be looked upon as representing the views, opinions, and experiences of a cross section of the industrial-arts teaching field.

The use of class projects in high-school industrial-arts work was favored by both high-school and college instructors. The college group favored the method by a larger majority than did the high-school group.

Experience in years	High-School Instructors	College Instructors	Total
Omitted	15	5	20
1—5	43	1	44
6—11	35	12	47
11—15	26	13	39
16—20	14	17	31
21 and over	8	15	23
Total	140	63	203

Table I. Amount of experience of respondents

High-school and college instructors were not in accord in regard to the use of production work. The former disapproved it by a small majority while the latter approved it by a slightly smaller majority.

Consensus of opinion shows that preliminary practice should be given the industrial-arts pupil to develop control of tools when there is danger of spoiling material. It also is shown that such practice should be given throughout the course rather than all at the beginning.

The size of the industrial-arts project must be controlled largely by the amount of time spent in the shop. The question here involved is whether the pupil should make as many large projects as possible in the time available, or make more small projects. The most desirable time limits according to these data are from two to five weeks.

Demonstrations should be given to pupils who are in immediate need of the information on their projects.

Published materials (books, magazines, and instruction sheets) should be made use of by the industrial-arts teacher.

Industrial-arts pupils should design their own projects. By "design" it should not be construed that the pupil actually is to create something new, but that he should combine ideas and parts of other designs, re-proportioning and reworking them to fit his personal requirements. The individual differences of the pupils may be taken care of through the suggestions and aid given by the instructor.

The pupil should make out a material bill for his project before starting work. College instructors favor this procedure more strongly than do high-school instructors.

	High-School Instructors	College Instructors	Total
Omitted	15	5	20
Junior High School	14	0	14
Senior High School	43	0	43
Junior and Senior High School	43	0	43
College	0	6	6
Junior High School and College	0	1	1
Senior High School and College	7	13	20
Junior High, Senior High, and College	18	38	56
Total	140	63	203

Table II. Kind of experience of respondents

The projects made by the industrial-arts pupil should form a sequence in difficulty, each leading to one more difficult.

There is considerable difference of opinion as to whether pupils should be required to make a written review of their procedure after the project is completed. The college instructors disapproved the procedure by a 2 per cent margin, and high-school instructors by 18 per cent. Pupils should be given training in judgment by having them judge the work of their fellow classmates.

Both high-school and college instructors disapprove requiring pupils to keep written records of their work each day.

Pupils should not be required to use methods not consistent with the nature of their projects. Several instructors remarked that trade practices should be followed.

Both groups of instructors expressed themselves in favor

of having pupils choose their projects from a group recommended by the teacher with permission to substitute a project of similar difficulty. The second choice was to have the pupil choose his project from a group selected by the teacher. By the latter method the teacher would select a group of projects and tell the pupils that they may make any one of them they choose; by the former method the teacher would select a group, as in the first case, and tell the pupils that they may make any one they choose or any other project containing the same operations and of similar difficulty.

Completed projects and pictures were rated as the best methods for suggesting projects to pupils. The high-school instructors were slightly more favorable toward completed projects while college instructors favored pictures.

Working drawings for the pupil's projects should be prepared by the pupil.

		High-School Instructors		College Instructors		High-School and College Instructors Combined	
1.	Should part of the course be devoted to work on class projects upon which the entire class works?						
	Yes	89	63.5%	51	80.9%	140	68.9%
	No	43	30.7%	8	12.6%	51	24.5%
2.	Should part of the course be devoted to production work, i.e., the pupils all make the same projects, but use production methods whereby each pupil performs one operation on all of the projects?						*
	Yes	51	36.4%	32	50.7%	83	40.8%
	No	79	56.4%	25	39.6%	104	51.2%
3.	Should the pupil be given preliminary practice to develop control of the tools if there is danger of spoiling material, in case he attempts the process, on his project?						
	Yes	116	82.7%	58	92.0%	174	85.7%
	No	23	16.4%	2	3.1%	25	12.3%
4.	Should the number of hours spent per week influence the size of the project?						
	Yes	114	81.4%	53	84.1%	167	82.2%
	No	24	17.1%	7	11.1%	31	15.2%
5.	Should demonstrations be given to the entire class when only a few have need for the instruction on their projects?						
	Yes	63	45.0%	22	34.9%	85	41.9%
	No	76	54.2%	36	57.1%	112	55.1%
6.	Should published materials (books, magazines, instruction sheets) be used to present subject matter?						
	Yes	130	92.8%	60	95.2%	190	93.5%
	No	9	6.4%	2	3.1%	11	5.4%
7.	Should the industrial-arts pupil design his own projects, with the aid and suggestions of the instructor?						
	Yes	118	84.2%	50	79.2%	168	82.7%
	No	14	10.0%	7	11.1%	21	10.3%
8.	Should the pupil be required to make out a material bill before starting his project?						
	Yes	125	89.2%	58	92.0%	183	90.1%
	No	12	8.5%	3	4.7%	15	7.3%
9.	Should there be a sequence between the projects made, each project leading to one more difficult?						
	Yes	125	89.2%	55	87.3%	180	88.6%
	No	15	10.1%	2	3.1%	17	8.3%
10.	Should the pupil make a written review of the procedure in the construction of his project after completing it, revising any plan he had originally as he found it necessary in the actual construction?						
	Yes	54	38.5%	28	44.4%	82	40.3%
	No	79	56.4%	29	46.0%	108	53.2%
11.	Should the class be given training in judgment by having them judge the work of their fellow classmates?						
	Yes	97	69.2%	47	74.6%	144	70.9%
	No	40	28.5%	14	22.2%	54	26.6%
12.	Should the industrial-arts pupil be required to keep a written record of the things he does each day?						
	Yes	26	18.5%	18	28.5%	44	21.6%
	No	113	80.7%	43	68.2%	156	76.8%
13.	Should the pupil be required to use methods or operations in the construction of his project, unwarranted by its nature, in order to get experience? (For example: should a boy be required to use mortise-and-tenon joints in making a rabbit pen?)						
	Yes	13	9.2%	0	0.0%	13	6.4%
	No	124	88.5%	60	95.2%	184	90.6%
14.	How much time should a project occupy to be of most teaching value?						
	a) One week or less	2	1.4%	3	4.7%	5	2.4%
	b) Two to three weeks	26	18.5%	15	23.8%	41	20.1%
	c) Three to five weeks	34	24.2%	12	19.0%	46	22.6%
	d) Five to nine weeks	16	11.4%	1	1.5%	17	8.3%
	e) Nine to twelve weeks	10	7.1%	3	4.7%	13	6.4%
	f) Twelve to eighteen weeks	12	8.5%	1	1.5%	13	6.4%
15.	The pupil's projects should be chosen						
	a) by the instructor	4	2.8%	3	4.7%	7	3.4%
	b) by the pupil, free choice	17	12.1%	2	3.1%	19	9.3%
	c) by the pupil from a group selected by the teacher	37	26.4%	13	20.6%	50	24.6%
	d) from a group recommended by the teacher, or a project of similar difficulty	60	42.8%	32	50.7%	92	45.3%
16.	Which of the following have you found to be the best method of suggesting possible projects to the pupil?						
	a) Pictures	45	32.1%	22	34.9%	67	33.0%
	b) Completed projects	54	38.5%	16	25.3%	70	34.4%
	c) Working drawings	13	9.2%	6	9.5%	19	9.3%
17.	The working drawing of the project should						
	a) be furnished by the teacher	26	18.5%	11	17.4%	37	18.2%
	b) be made by the pupil	96	68.5%	28	44.4%	124	61.0%
	c) be purchased	3	2.1%	6	9.5%	9	4.4%
18.	The job sheet for the project, if one is used, should						
	a) be made by the pupil	47	33.5%	13	20.6%	60	29.5%
	b) be made by the teacher	52	37.1%	22	34.9%	74	36.4%
	c) be purchased	21	15.0%	7	11.1%	28	13.7%
19.	If preliminary practice is given						
	a) it should all be given at the beginning of the course	14	10.0%	2	3.1%	16	7.8%
	b) it should be given throughout the course	126	90.0%	57	90.4%	183	90.1%
20.	Abilities which are not included in the pupil's projects						
	a) should be omitted	44	31.4%	29	46.0%	73	41.8%
	b) should be taught by the use of exercises	66	47.1%	19	30.1%	85	38.9%
	c) should be taught with pseudo jobs	17	12.1%	4	6.1%	21	10.3%
21.	The industrial-arts pupil should have as his objective						
	a) the making of his project	32	22.8%	23	36.6%	55	27.0%
	b) the learning of operations and tool processes	96	68.5%	29	46.0%	125	61.5%
22.	Reading assignments should be made						
	a) to the entire class	54	38.5%	24	38.0%	78	38.4%
	b) to those who will need the information soon on their projects	21	15.0%	6	9.5%	27	13.3%
	c) individually as information is needed	51	36.4%	24	38.0%	75	36.8%
23.	Class discussions should be held						
	a) for those to whom the material discussed is of immediate value in the construction of their projects	24	17.1%	17	26.9%	41	20.4%
	b) for the class as a whole	92	65.7%	30	47.6%	122	60.0%
	c) for all of those who know that they will need the information within a few weeks	11	7.8%	10	16.0%	21	10.3%
24.	Related material should be taught						
	a) just before the pupil needs it in the construction of his project	60	42.8%	23	36.6%	83	40.8%
	b) by regular assignments to the entire class	65	46.4%	33	52.3%	98	48.2%
	c) by special credit assignments for those interested in making higher grades	4	2.8%	3	4.7%	7	3.4%
25.	The industrial-arts teacher should place major emphasis upon						
	a) speed	1	0.7%	1	1.5%	2	0.9%
	b) accuracy	32	22.8%	7	11.1%	39	19.2%
	c) correct methods	83	59.2%	42	66.6%	125	61.5%
26.	Jigs and machines which are not too dangerous should be used						
	a) after the pupil has learned to perform the operation by hand, when by so doing the work can be speeded up	133	95.0%	53	84.1%	186	91.6%
	b) by the beginner who cannot produce good work by hand	3	2.1%	1	1.5%	4	1.9%
27.	Which of the following methods have you found most satisfactory in handling the pupil who cannot afford to make projects for himself?						
	a) Have him make things needed around the school	67	47.8%	25	39.6%	92	45.3%
	b) Take in work to be done for townspeople	25	16.4%	8	12.6%	31	15.2%
	c) Make projects for sale	17	12.1%	8	12.6%	25	12.3%
28.	Exhibits of pupil's projects should						
	a) be eliminated	10	7.1%	5	7.8%	15	7.3%
	b) be a part of the school exhibit when one is held	54	38.5%	16	25.3%	70	34.4%
	c) be exhibited in downtown windows or buildings	20	14.2%	3	4.7%	23	11.3%
	d) be exhibited continuously in the building, placing the projects on exhibit for a few days as they are completed	25	17.8%	21	33.3%	46	22.6%
29.	In grading the pupil's projects, which of the following factors should be rated first in importance in fixing the grade? Second? Third?						
	The difficulty of project 1...	4	2.8%	3	4.7%	7	3.4%
	2...	7	5.0%	1	1.5%	8	3.9%
	3...	5	3.5%	0	0.0%	5	2.5%
	The improvement in ability 1...	24	17.1%	13	20.6%	37	18.2%
	2...	24	17.1%	4	6.1%	28	13.7%
	3...	37	26.4%	17	26.9%	54	26.6%
	Time taken to make the project in relation to its difficulty 1...	2	1.4%	1	1.5%	3	1.4%
	2...	6	4.2%	5	7.9%	11	5.4%
	3...	13	9.2%	10	16.0%	23	11.3%
	The accuracy and quality of workmanship 1...	61	43.5%	10	16.0%	71	34.9%
	2...	33	23.5%	15	23.8%	48	23.6%
	3...	21	15.0%	11	17.4%	32	15.8%
	The quality of thinking and planning 1...	35	25.0%	25	39.6%	60	29.5%
	2...	41	29.2%	16	25.3%	57	28.0%
	3...	18	12.8%	8	12.6%	26	12.8%
	Initiative 1...	5	3.5%	3	4.7%	8	3.9%
	2...	21	15.0%	12	19.0%	33	16.2%
	3...	29	19.0%	9	14.2%	37	18.2%

Table IV. The questionnaire together with the responses given by high-school instructors, college instructors, and high-school and college instructors combined. Where instructors combined two or more parts of a question, their responses were omitted from the table. A few instructors also omitted one or more of the questions. The percentages given, therefore, do not total 100 per cent in most cases

When job sheets are used the instructors preferred that the teacher make them; second preference was given to having the pupil make his own job sheet.

High-school instructors favored teaching abilities not included in the pupil's projects by exercises. College instructors favored omitting the teaching of such abilities. They indicated by their remarks that they would incorporate all of the abilities they wished to teach in projects.

State Universities	4
Non-State Universities	3
State Teachers Colleges	40
State Normal Colleges	3
Normal Colleges	2
State Agricultural Colleges	1
Denominational Colleges	1
State Normal Industrial Schools	2
Institutes of Technology	3
State Colleges	4

Table III. Types of institutions in which college instructors who responded are now employed

High-school instructors were strong in the opinion that pupils should have as their objective the learning of operations and tool processes. College instructors favored their having the learning of operations and tool processes for their objective in preference to the making of their projects by a 10 per cent margin.

College instructors were equally favorable toward making reading assignments to the entire class and individually. By a very small margin the high-school instructors placed their preference on the class assignment.

First preference was given to holding class discussions for the class as a whole by both high-school and college instructors. Second preference was given to the use of class discussions for those who have immediate need for the instruction in the construction of their projects.

Regular assignments were preferred for teaching related material by both high-school and college instructors. A slightly smaller number of instructors in both groups preferred to teach the related material as needed in the process of making the project.

The majority of the instructors in both groups favored placing emphasis on correct methods in preference to either speed or accuracy.

The use of jigs and machines by pupils who are able to perform the operations by hand was accepted by the majority of the instructors in preference to having them used by the inexperienced.

Both high-school and college instructors report that they have had most success in handling the pupil who cannot afford to make projects for himself by having him make things for the school. The high-school instructors placed second preference on taking in work to be done for townspeople; college instructors placed equal importance on making projects for townspeople and making projects for sale.

On the question of industrial-arts exhibits, high-school instructors favored the industrial-arts exhibit forming a part of the all-school exhibit. College instructors favored the continuous exhibit. This expression of preference for certain types of exhibits should not be taken to mean that other types of exhibits are not valuable in many cases, but that instructors consider these to be of most value in promoting and advertising industrial-arts work.

Accuracy and quality of workmanship, quality of thinking and planning, and improvement in ability were chosen by high-school instructors in the order named as the three major qualities to be considered in grading projects. The college instructors chose quality of thinking and planning for first consideration, and also gave it the largest number of votes for second consideration. Third consideration was given to improvement in ability.

Economical General-Shop Course

Edward J. Pedersen

High School, Panama, Nebraska

How one shop teacher has tried to make his general shop function fully and yet cheaply.

TO MAKE the general-shop course as effective as possible even in these times of reduced budgets, it is necessary to present the shop course in such a way that it is of practical value in the home. That means that the students must be encouraged to bring as many working units to the school shop as possible. The students will be glad to do that if the shopwork is then made as interesting as possible. These home projects also will do much to make the work of the school appreciated. Furthermore, every home project is a practical way of measuring the value of the general-shop course.

In order to make the work as effective as possible, about one third of the total class time should be spent on the related information and the rest on the practical work.

Woodworking

The woodworking possibilities in the general shop include jobs in carpentry, cabinetmaking, wood turning, and wood finishing.

Operations Performed

1. Sharpen cutting tools, using grindstone and the sharpening stones.
2. Assemble and use a plane.
3. Assemble and use a marking gauge.
4. Square a board to three dimensions.
5. How to use a crosscut saw.
6. How to use a rip saw.
7. Assemble and properly use a coping saw.
8. Use the hammer correctly.
9. Use and test try-squares for accuracy.
10. Use of the miter box.
11. Proper use of sandpaper.
12. Use of screws and the proper way of setting.
13. Use and clean files.
14. Apply stains, shellacs, paints, and wax.
15. Use and application of paint removers.
16. Use and application of plastic wood and like repair materials.

Related Knowledge

1. Reading a rule and measuring.
2. Sizes of auger bits.
3. Sizes and kinds of nails and brads.
4. Sizes and description of screws.
5. Kinds of common wood fasteners.
6. Grades of sandpaper.
7. Kinds of glue suitable for use in woodworking.
8. Kinds of joints and how to make each.
9. How logs are made into lumber.
10. Reasons for painting or wood finishing.
11. How paints are made.
12. Different kinds of metal.
13. The different kinds of lumber.
14. The names of the common woodworking tools.

Electricity

With the increasing use of electricity it is most essential that every individual have at least a general knowledge of it. All electrical jobs should be in form of class demonstration first after which the actual work on the project is performed by the students. This procedure is followed as a matter of precaution.

Operations Performed

1. Make the common wire splices.
2. Solder and tape properly the splices.
3. Connect plug and socket.
4. Correctly tie an "underwriters'" knot.
5. Make a 110-volt or 220-volt extension cord.
6. Hook up dry cells in parallel.
7. Hook up dry cells in series.
8. Make a simple bell circuit.
9. Wire a bell circuit that will ring two bells from one push button.
10. Wire a bell and a buzzer that operate on separate push buttons but use the same battery.
11. Detect and remove trouble in a bell circuit.
12. Assemble some common household electrical appliances such as the plug of a flatiron, heater, or a toaster.
13. Make an electromagnet.
14. Make a simple transformer.

Related Knowledge

1. Sources of electricity.
2. Nature of electricity.
3. Conductors and nonconductors of electricity.
4. Reasons why splices should be soldered.
5. Cause and dangers of short circuits.
6. Proper cutting of insulation in making splice.
7. Use of extension cord.
8. Use of plug and sockets.
9. Structure of plugs and sockets.
10. Use and structure of fuses.
11. Principles of connecting dry cells.
12. Use and structure of push buttons.
13. Structure of an electric bell.
14. Common household appliances and their uses.
15. Reading an electric-light meter.
16. Dangers of electricity.

Metal Work and Plumbing

Metal work and plumbing offer many practical projects in the home. The student should be made to take interest in these projects, because while the work is not difficult, yet quite a degree of accuracy is required.

Operations Performed

1. Rewasher a leaking compression faucet.
2. Install a new ball in a Fuller faucet.
3. Assemble pipe fittings.
4. Cut and thread pipe or iron rod.
5. Ream the end of a pipe.
6. Make a metal corner brace.
7. Make a metal corner brace using rivets in joint.
8. Drill and tap holes for machine screws and stove bolts.
9. File a key for a common mortise or Yale lock.
10. Replace a broken spring in a mortise lock.
11. Repair a broken cross link in an automobile tire chain.
12. Mend a hole in a piece of sheet metal or a cooking utensil.
13. Tin a soldering copper.
14. Make a sugar scoop and cooky cutter from a tin can.

Related Knowledge

1. Principle of compression faucet.
2. Principle of Fuller faucet.
3. Precautions as to the use of a compression and of a Fuller-type faucet.
4. Kinds and uses of plumbing fittings.
5. Sizes of common dies.
6. Precautions used in threading pipes.
7. Uses and possibilities of cold metal.
8. Tools used in cold-metal work.
9. Precautions used in riveting.
10. Principle used in tapping a hole in iron.
11. Precaution used in filing a key.
12. Principle of door lock.
13. Composition of solder.
14. Use of soldering paste and rosin.

Home Mechanics

In this field, the students will find many valuable and interesting projects. Students that show exceptional interest may add some original projects.

Operations Performed

1. Tie some common useful knots.
2. Replace a broken window sash.
3. Reseat a hand-caned chair.
4. Half-sole a pair of shoes.
5. Repair a window blind.
6. Clean out a sink drain.
7. Clean out an oil or gas burner.
8. Repair a blowout in an automobile tire.
9. Attach hose couplings and menders to a hose.
10. Sharpen a garden hoe.
11. Sharpen a sickle.
12. Sharpen a pair of scissors.
13. Sharpen a bread and a paring knife.

Related Knowledge

1. Weights and kinds of rope.
2. Grades of cord.
3. Principle of cutting glass.
4. Making putty.
5. Principles used in caning.
6. Principle of the window blind.
7. Precautions used in cleaning a sink drain.
8. Adjusting the air on a clean gas burner.
9. Natural and artificial gas and precautions.
10. Precautions used in repairing a blow-out.
11. Grades of rubber and how to tell them.
12. Kinds of attachment for garden hose.
13. Use of whetstone on sharpened tools.
14. Precaution used in sharpening scissors.

Mechanical Drawing

Mechanical drawing affords valuable training in the reading of drawings. Students become acquainted with the fact that a drawing frequently is necessary in order to proceed in the construction of a project. The more difficult projects should first be drawn by the students. This will show the student a need for accuracy and impress him with what he is doing.

Operations Performed

1. Simple lettering.
2. Simple two-view drawings of objects.
3. Drawing involving invisible edges.
4. Drawings involving three or more views.
5. Drawings involving inclined lines.
6. Drawings involving circles.
7. Drawing of projects in shopwork.

Related Knowledge

1. Correct method of sharpening drawing pencil, and a ruling pen.
2. Correct use of drawing instruments.
3. Various types of lines used in drawing.
4. Symbols used in drawings.
5. Symbols representing machine parts.
6. Symbols used on electrical wiring diagrams.
7. Symbols used on architectural drawings.
8. Principles of orthographic projection.
9. Interpretation of blue prints.
10. Designs used in furniture and buildings.

Concrete Work

Concrete has in a very short time become one of the most useful, if not *the* most useful building material. Its use is widespread, and many small but practical jobs can be worked out in concrete.

Operations Performed

1. Make a common mixture of concrete.
2. Set a mix, regulating setting and hardening.
3. Tamping of concrete.
4. Make a concrete form.
5. Make a cement plaster mix and apply.
6. Mix cement for stucco work and apply to lathing.
7. Mix a sub-base mix and lay for a sidewalk.
8. Mix a finishing mix and apply.
9. Mold and make some small cement blocks.

Related Knowledge

1. Importance and uses of cement in everyday work.

2. Kinds of mixtures and uses of each.
3. Different ways of mixing and advantages of each.
4. Tools used in concrete work.
5. Ways of placing the concrete in forms.
6. Protection of concrete from weather.
7. Uses of concrete in building a house.
8. Uses of concrete for decorations around a house.
9. Kinds of finishing coats.
10. Kinds of cement building blocks.
11. Process used in laying a sidewalk.
12. Forms that may be used in concrete.
13. Farm uses of concrete.

It is suggested that at least two projects be planned and carried out by the entire class during a regular school year.

Principles of Design—VI

Franklin H. Gottshall

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The sixth and last of this series of articles is based on the use of color.

COLOR

A STUDY of the principles of design is not complete without a study of color. It is, therefore, quite fitting that this series should end with a brief discussion of this most important subject. No one expects, of course, that reading a short treatise on an important subject of this kind will equip the reader with the skill necessary to use color intelligently. Color is a medium of expression that requires some experience and judgment before it can be used with any degree of success. The value of a brief dissertation of this kind will lie chiefly in its ability to stir the imagination, and perhaps to bring about a desire to experiment with color on objects in everyday use.

The use of color should not be restricted to the artist who paints pictures. There is an urgent need for more color in the home. A visit to the average American home makes anyone who has a color consciousness realize how great this need really is. Upon entering the average American home, one is too often depressed by the chocolate-brown aspect of the furniture, by the dull, expressionless walls and hangings, and the seemingly utter lack of any sense of color values. How inexpensively these homes could be made much brighter. How much more attractive and desirable places to rest and relax after the strife and turmoil of a day's hard work, would they be, if a little knowledge were put to the practical uses to which it deserves to be put. In the furnishing of a proper background for furniture and other objects alone, a knowledge of color will be of great value. But there need be no restrictions, once this medium is thoroughly understood and appreciated. Our schoolwork in art classes should not be restricted to the drawing and coloring of pictures. Its scope must be broadened to an appreciation of proper color schemes for the home, on all kinds of objects that are constantly used.

A scheme of furnishing cannot be entirely successful unless the relation between the furniture and the background is harmonious. Since a relation always exists between colors, be it good or bad, it is only proper that the designer should make it his business to see that proper relations exist, so far as lies within his power. Properly colored walls, woodwork, floors, ceilings, and draperies are essential to a successful scheme of furnishing. Some colors scream for recognition, and these cannot be used in large amounts if a restful atmosphere is de-

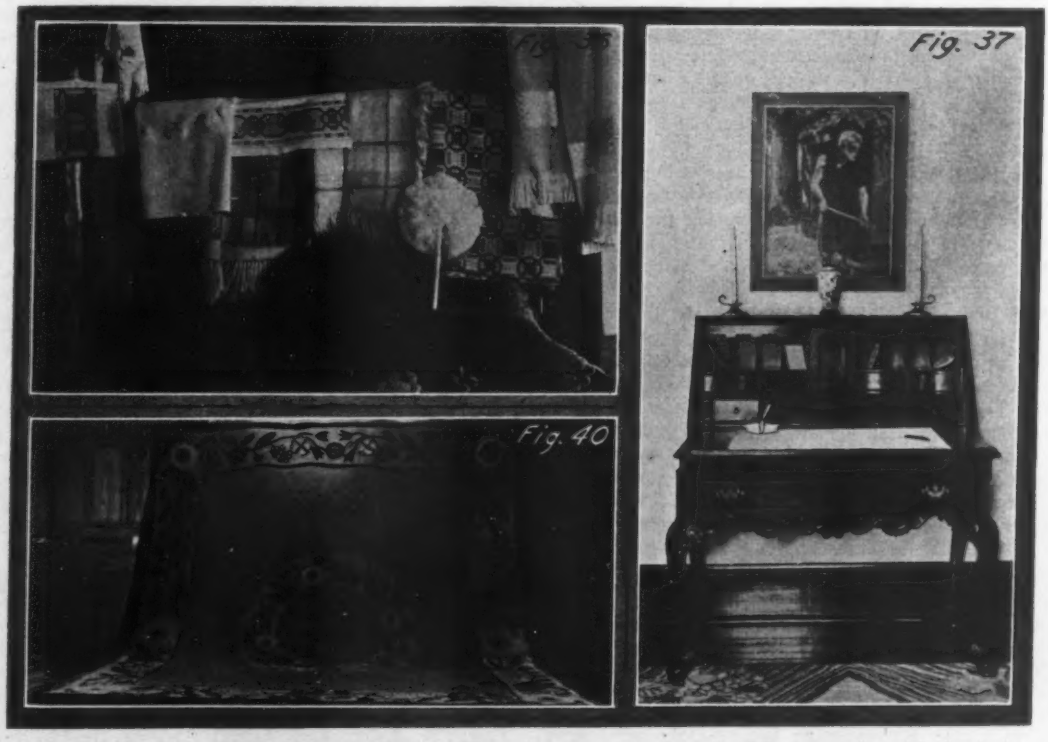

Fig. 36. Products of a hand loom. Fig. 37. The colors of vase and candlesticks harmonize with the dark mahogany desk. Fig. 40. Color harmony in a hand-hooked rug

sired. Other colors whisper, and lull one to repose. Colors have a far greater influence upon the dispositions of the occupants of a home than most people realize. To choose them carefully becomes then, a duty as well as a privilege.

It often becomes necessary for the designer of furniture to choose the proper colors for upholstering materials, for picture frames, and for the pieces of furniture themselves. Painted furniture of good design, if properly colored, is desirable. Some of the finest creations of Italian, French, English, and even American designers were painted by artists of considerable skill. William and Mary cabinets, Brothers Adam consoles, Hepplewhite tables, and Pennsylvania German dower chests were colored, and were objects of great beauty. The value of color in the design of textiles can hardly be estimated. Figure 36 shows products of a hand loom, and other craftwork projects, in the designs of which color plays a very important part. In pottery its use for the different glazes requires the skill of highly trained artists and craftsmen. In Figure 37 is shown a small Chinese cloisonné vase, the color of which is an exquisite delft blue, which harmonizes wonderfully with the deep red mahogany of the desk. In metal work and jewelry, brilliant gems and brightly colored enamels make pleasing patterns on the neutral colored backgrounds. And so the story goes. Color is something that most of us should know a great deal more about.

Assuming that the reader has had no previous knowledge about color, it is necessary to define a few terms, so that he may acquire a nomenclature of the terms constantly used when speaking about color. There are three colors known as primary colors, which cannot be broken up to form other colors. They are red, yellow, and blue. All other colors are made from mixtures based on these three. Yellow and red mixed together make orange, yellow and blue make green, and red and blue make violet. The results of these mixtures are known as secondary colors. Secondary colors also may be mixed with each other to form tertiary colors. There are three of these, i.e., olive, citrine, and russet.

All colors possess three distinct properties. These properties are known as hue, value, and intensity.

Hue is another name for color, the two being synonymous. Twelve equally graded hues may be selected from an unlimited number of possible variations on the color spectrum. They are: red, orange-red, orange, orange-yellow yellow, yellow-green; green, green-blue, blue, blue-violet; violet, and red-violet.

Value is the quality by which light hues are distinguished from dark hues. Its gradations are known as tints and shades. The term *tint* refers to those colors running from white to middle value. The term *shade* refers to the gradations from middle value to black. There are an infinite number of color values ranging from white to black. In order to make a scale that is workable, we will limit our value scale to nine. They are white, high light, light, low light, middle, high dark, dark, low dark, and black.

The quality of intensity relates to the brilliance or purity of colors. The intensity, or chroma, as it is sometimes called, may have gradations, but a scale of four will suffice for ordinary purposes. These may be designated as full intensity, ¾ intensity, ½ intensity, and ¼ intensity. Below ¼ intensity, a hue begins to verge into neutral gray. The intensity of a color is reduced by mixing it with its complementary color. Theoretically we do not reduce the intensity of a color by the addition of thinners, white or black. Actually, when mixing pigments, we may reduce the intensity by such addition.

Complementary colors are colors which when mixed together neutralize, or gray each other. That is, when green, which is the complement of red, is mixed with it, a gray will result. The same is true if violet is mixed with yellow, or orange with blue. Red-violet and yellow-green are complementary hues, because they are mixtures of hues that are complementary. For the same reason orange-red is the complement of green-blue, and orange-yellow the complement of blue-vliolet. To make the above as clear as possible, a chart is shown on which the complementary colors are diametrically opposite each other. See Figure 38.

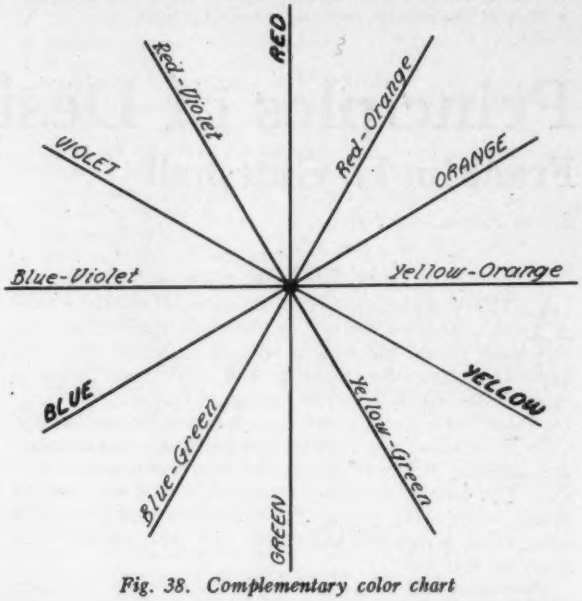

Fig. 38. Complementary color chart

Another chart has been drawn to show the reader the relation that exists between hue, value, and intensity. See Figure 39. It is composed of five concentric circles. These have been divided into fourteen sectors, each one representing a hue; and black which is the limit of color on the dark side, and white which is the limit of color on the bright side. On the outside of this color wheel, beginning with the number 1 and going in a clockwise direction, are the nine color values, shown in their proper order. In the next circle are shown the hues at their full color strength, and each in its proper *value* sector. Green-blue, found in the *middle value* sector, is a

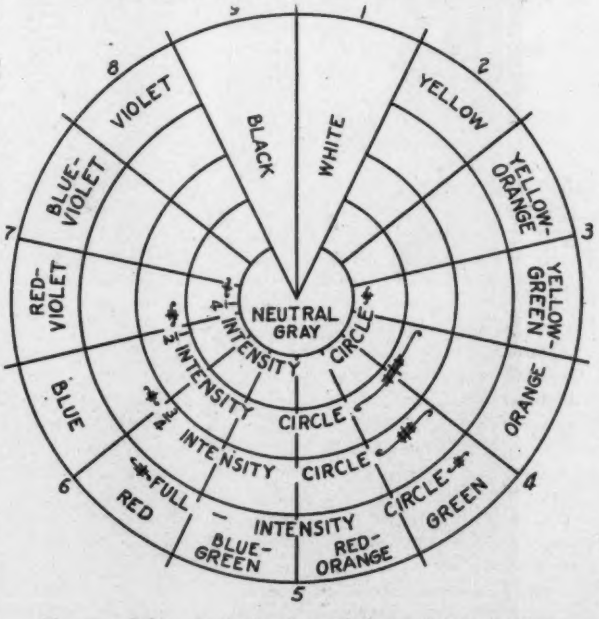

Fig. 39. Color chart showing relations of hues, values and intensities

shade darker than green which is found in the *low light value* sector. The remaining circles represent degrees of intensity. If one part of green is mixed with four parts of red, it results in a red of ¾ intensity. This hue would be found in the red sector where it crossed the ¾ intensity circle. If equal parts of red and green are mixed, the hues should entirely neutralize each other, forming gray.

Color Harmonies

To use colors properly to form beautiful color schemes, several methods or systems have been worked out which prove satisfactory. Color charts, and systems are necessary, but, like multiplication tables in arithmetic, they should be used only as stepping stones to an understanding of principles, or for exact reproduction of numerous identical hues. Artists seldom need to use them, devices of this kind going into the discard as soon as experience makes them unnecessary.

A great deal of the harmony and effectiveness of a scheme of furnishing will depend upon the background which is composed of the walls, woodwork, and floors. Figure 37 shows this. Light walls are good backgrounds for the effective display of furniture and pictures. A paper with too much figure, or colors that are too dark or too brilliant, form backgrounds that destroy or hide the beauty of the furnishings. The baseboard in back of the desk is too dark, taking away a great deal from the beauty of the piece of furniture. This is a common fault in houses where no predetermined scheme of decoration has been followed. There are several things the beginner may safely do in treating backgrounds to get satisfactory results. Ceilings should be lighter than walls; walls should not be darker than middle value; trim and walls should vary only slightly in value and intensity; and floors should be darker than either walls or woodwork.

Pure white is not best for ceilings, because it may cause a glare. Very light ivories, or grays are better, and walls should be treated in the same manner. Light varnished floors are then possible, since the golden yellow is still darker than the walls, and besides partakes of the qualities of gold, which is a neutral and may therefore be used in any scheme.

The greater the area to be colored, the less intense the colors should be. This makes possible the showing to better advantage of furniture, and people, which are, of course, of much greater importance than any background could possibly be. In Figure 40 is shown a large hand-hooked rug. The large background area is a soft brown of about high dark value. It has a slight purplish tinge, and is a beautiful semineutral color. The background for the border is a much brighter hue of about light value, forming a fitting ground for the more brilliant small spots of color to show up effectively. The intense and brilliant colors are reserved for small areas, such as centers of flowers. Even the leaves are shaded with browns and orange, to lessen their intensities, and soften the outlines.

There are two important systems for securing color harmony. One system is known as related harmonies, and the other is known as contrasted harmonies. There are two related harmony groups. One is known as harmony by analogy, and the other is known as the one-hue harmony.

Harmony by analogy is secured by relating all the colors in a scheme to one major color; that is, all the hues used in the scheme have that one color element contained in themselves. For example, violet, red-violet, and red form a relationship of this kind, because all of these hues contain red as the common element. Green, yellow-green, and yellow is another analogous relationship, each color containing yellow. The color schemes need not be limited to three hues, but may contain more. Complementary colors are not used in an analogous scheme.

In the one-hue harmony only one color is used, variety being achieved by varying the value, intensity, and texture of the hues. This scheme is apt to be monotonous if carried to too great lengths. A bright spot of color introduced as an accent will relieve some of this condition. Black, white, gray, silver, and gold are neutrals, and may be used in any color scheme.

Contrasted harmonies are secured by using complementary colors, double complementaries, split complementaries, and triads.

A complementary harmony is one in which complementary colors are used. A complementary harmony may be brought about in several ways. One method is to use the hues in varying intensities. The larger the area covered by one hue in the scheme, the less intense it should be, as explained about the rug in Figure 40. Another method is to separate the hues by areas of neutrals. The brightest spots of color should be reserved for places where the greatest amount of interest is to be centered.

Double complementary harmonies are brought about by using two adjacent hues, such as are found on the complementary chart, with their complementary colors. A double complementary scheme would be red and orange-red with green and green-blue. In such a scheme there should be one brilliant color, but it should be used in the smallest amount. The hue covering the most space should be the least intense of them all.

Split complementaries are composed of a primary and the colors found on either side of its complement on the complementary color chart. Blue, used with orange-red and orange-yellow, is an example of such a scheme. One cannot start a split complementary harmony with a secondary color, because the opposite primary color cannot be split.

The triad schemes are made up of combinations of three hues which are equidistant from each other on the complementary color chart. There are four possible triad schemes:

1. The primary triad — red, blue, and yellow.
2. The secondary triad — green, orange, and violet.
3. The intermediate triad — yellow-orange, blue-green, and red-violet.
4. The intermediate triad — yellow-green, blue-violet, red-orange. The triads are difficult to use. They require that the greatest area of color must be almost gray. The next greatest area should be at least half neutralized, and the third, if bright, should cover only small areas.

Related Shop Mathematics

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The author emphasizes the fact that shop mathematics takes on a new meaning if the problems presented really are related to shop situations.

IT IS necessary, when teaching mathematics to the apprentice in the classroom, that there be a continual reference to the shop. The development of the underlying skills, together with the application of problem solving, must be in terms of shop situations.

Assuming that the apprentice has an equivalent of an eighth-grade training (and many have had some work in high school), he is probably familiar with the manipulation of whole numbers, fractions, and decimals. It is the failure to associate his knowledge with the shop, and translate these skills to specific machine operations, that causes him difficulty, and incidentally, makes the shop foreman extremely skeptical of related training.

Much of this relation may be accomplished by the class setting. The lesson sheet may be set up in such a way as to invite discussion. This participation of the class may then well be turned back to the shop for illustration. Problems drawn for the student should be in accordance with the standard drafting procedure of their shop. In this way a recognition of a familiar drawing will identify the problem to his machine. Then, too, it is possible to give a problem of such nature that the class will have to decide the method of solution from a number of considerations which must be agreed upon. The "one best way" will determine the proper solution.

An illustration is shown by the following problem. The problem as stated on the lesson sheet was: How many pieces 7⅝ in. long can you get out of 4 feet of stock? The various reactions of the twenty boys in the class was interesting. A very few began immediately to divide 48 in. by 7⅝ in. The majority, however, clamored for more information. Questions such as "How big is the stock? What is the material? What are you using it for? How much allowance for cut-off? Are we to cut it off on the lathe, shears, or how?" all indicated that the boys were thinking in terms of a job in the shop.

The writer has talked with many of the apprentices who have had a year or more in senior high school. Their reaction, in the main, has been that although they have had all of the mathematics involved in the calculations, yet they had in no way attempted to organize their material on a working basis. In every case the boy was intensely interested in finding that his knowledge of mathematics must be of such quality that he might actually make a calculation with a definite plan in mind. The element of accuracy in result, from the fact that his machine set-up depends upon it, takes an entirely new meaning.

Another excellent discussion type of problem consists of a drawing of a 2⅛-in. diameter shaft with a square end 1.504 in. milled on the end. The problem asks for the depth of cut required. The discussion following this problem involves such matters as set-up, how to check the accuracy of the work, how deep the cutter should be set, and the problem of production in quantities.

The problems of planes, angles, angle plates, right angles, and taper turning may all be referred to the machine as the basis for calculation. The apprentice should think in terms of his established planes on the machine, and the relation of tool travel and tool angle to his machine plane.

The real objective of the related mathematics is to give the apprentice the tools for solution of shop problems, but with it must come a confidence in himself that he can project his solution into the shop situation and be sure that his result will be accurate in both method and dimension.

Common Woodworking Tools—V

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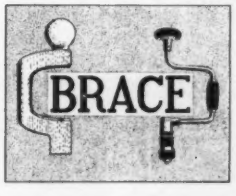
The fifth of a series of sketches on the development of woodworking tools.

THE BIT BRACE

BORING tools have always had to have some auxiliary tool to hold them when in use. The stone awl of primitive man had to have a wrapping of fiber or skin to protect his hand from the sharp, rough corners; his stone drill had to have a shaft of reed so that it could be twirled between the palms, as shown in Figure 34 on page 9 of the January, 1935, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. Today our auger bits must have a brace or they are as useless as were stone drills without their twirling shafts. The ancestry of our present-day brace extends back to these primitive holding devices of the Stone Age man.



The hand-rotated reed drill was rather awkward to operate, and men found that it could be turned more easily by wrapping a cord about it and pulling the cord. Cord-operated drills developed in two forms, the strap drill and the bow drill.

The strap drill still is to be found in use among the Alaskan Eskimos in the one-man form shown in Figure 48. It was well known to the ancient Egyptians and Greeks, but as a two- or three-man tool. The Egyptians illustrated it in their carved pictures, and Homer, in his *Iliad*, tells of boring "with a drill while his fellows below spin it with a strap, which they hold at either end." In the one-man form, Figure 48, the upper end is a separate socket piece held in the mouth; the two ends of the strap are held in the hands. When operated, the strap is drawn tight and alternately right and left, so that the drill point is rotated first one way and then the other. In the two- or three-man type, a man pulls at each end and either one of them or a third steadies the tool. Sometimes the shaft extended through a rock or other weight that acted like a flywheel and made it possible to spin the drill continuously in one direction like a top.

The bow drill, Figure 49, developed along with the strap drill in most parts of the world. The ancient Egyptians showed it with the strap drill. It survived in Europe in certain trades throughout the Middle Ages, long after the bow ceased to be a weapon. Its use has continued even to the present. However, the woodworker discarded the bow drill centuries ago when his associated workers in metal learned to make for him bits that forced out shavings instead of particles of wood dust.

When the true boring or shaving-cutting bit came into use, woodworkers had to have a holding tool that would permit of the application of considerable turning force. It is logical to suppose that the simple cross auger handle would be the first answer to such a need. It may have been, though we have earlier historical record of the brace than of the auger handle. It is recorded that an artificer of Athens invented the gimlet, or wimble, about 1240 B.C., but whether he invented the twisted boring end, or the cross handle to a drill previously turned by other means is not clear.

However simple the auger handle is today, it has not always been so. Due to the screw feed on the end of the modern auger, the cross handle now serves only to rotate the tool, but in more ancient tools this handle had to serve also as a means of pressing the tool into the wood. With this in mind, it is not surprising, when we find an old fourteenth-century picture of Noah building the Ark, that he is using an auger equipped with a wood breastpiece — quite similar to the more recent Finnish auger shown in Figure 50.

The bit brace is a very ancient tool, for in an ancient Egyptian picture a workman is clearly shown using one in building a mummy case. Egyptian pictures lack detail, hence it is impossible to determine out of what material they made their braces or if the bits were detachable from the brace.

Several of the ancient Roman bits that have been found would fit nicely into a brace, but we have no braces that old. Very probably the ancient woodworker made his own brace and so made it of the material he had the skill and tools to

work best. Wooden braces seem to have been the customary kind throughout the Middle Ages. In a Brussels gallery is a picture dating from the fourteenth century, showing St. Joseph boring holes with a wooden brace quite like those pictured in Figures 51 and 52.

It is interesting to notice in the 1760 brace, Figure 52, that the iron bit fits into a wood shank, and this wood shank slips into a square hole. The intermediate wood shank seems to have been customary on early bits intended to be used in wooden braces. Many old bits have the metal at the upper ends simply flattened as though to be driven into wooden shanks. The bits shown in Figure 35 on page 9 of the January, 1935, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION have such flattened ends.

Bits having square taper tangs, like modern bits, have to be used with metal sockets. Probably the first metal sockets were used in braces made of wood, as, for instance, the fine old tool shown in Figure 53 and at B in Figure 54. This tool not only has a metal socket but a very efficient device for locking and releasing the bits.

The two oldest metal braces that have come to the attention of the writer are those illustrated in Figures 55 and 56. The former is from an old French encyclopedia published in 1769. The other was drawn from a brace now in the Cleveland Art Museum and is labeled *17th Century*. We must admire the artistry and craftsmanship of these fine old tools even if they are all out of harmony with our modern ideas of tool design. They give us an answer to why the sweep handle or center of a brace is called by some writers the *ball*.

The first factory to make braces in America appeared about 1850. These braces were quite crude cast-iron affairs with a rivet for the head to turn on. There was no free-turning handle in the sweep, and the bit was held in the square socket

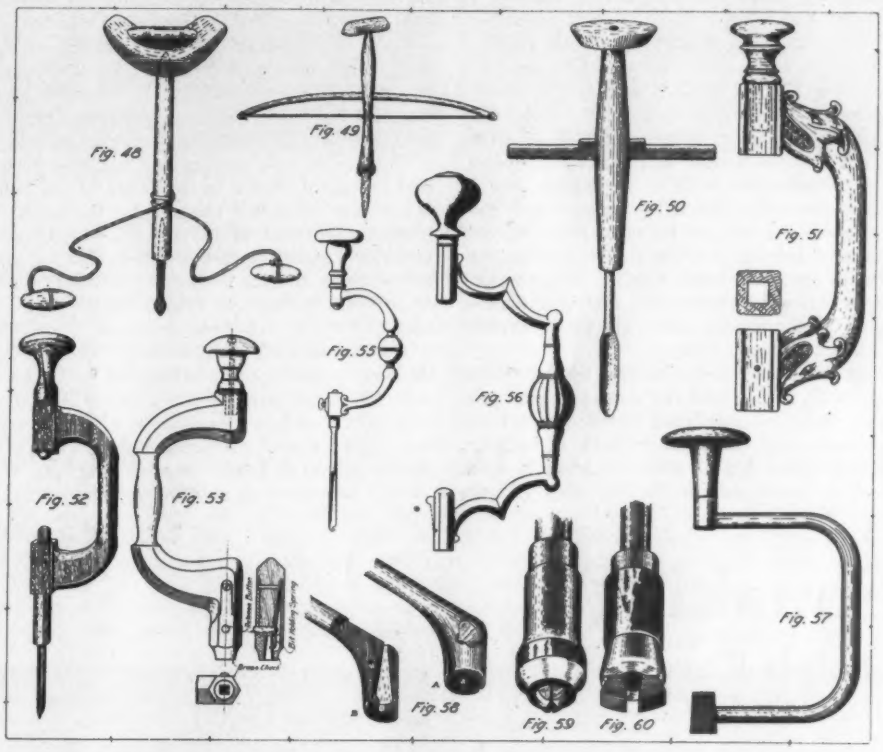


Fig. 48. The strap drill. Fig. 49. Primitive bow drill with stone bit. Fig. 50. Ancient auger from Finland. Fig. 51. 17th Century European wooden brace now in the Cleveland Art Museum. Fig. 52. A wooden brace made in Connecticut about 1760. It sold in 1820 for $1.25 as a usable tool. It is now in the Historical Museum of Western Reserve University, Cleveland, Ohio. Bit is a gouge bit with a wooden shank that is held in the brace by a small wooden cross pin. Fig. 53. Wooden bit brace with brass chuck. Made about 100 years ago. Fig. 55. A French brace and nose bit redrawn from L'Art du Menuisier, published in 1767. Fig. 56. A 17th Century bit brace now in the Cleveland Art Museum. Fig. 57. Cast-iron brace made about 1850. Fig. 58. Spofford brace jaws or chuck. A, outside; B, one-half broken away to show socket for bit tang. Fig. 59. The Barber brace chuck. Fig. 60. The Fray brace chuck

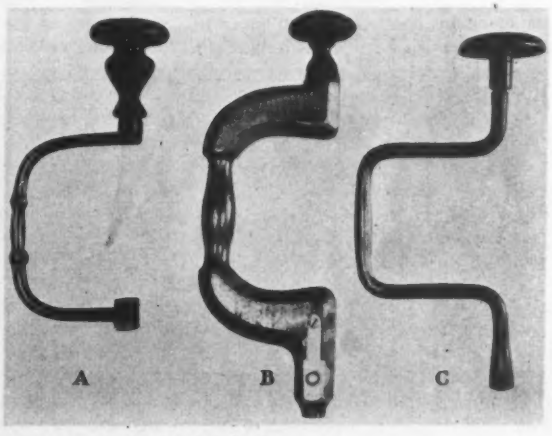


Fig. 54. Early braces with metal sockets

by a thumbscrew. Figure 57 is of one of these old braces redrawn from a picture in a Peck, Stow and Wilcox Company's catalog in which is the statement, "The first brace made in America — 1850 — was a Pexto brace."

An early improvement of the iron brace was to lighten it by making the body of wrought iron and the head of wood. It was refined at the same time by giving it a free-turning center handle. These braces came out about 1865. A brace of this type, with the center and thumbscrew missing, is shown at A in Figure 54.

These early iron braces came out before the days of manufacturing standards so that each bit manufacturer made the tangs to his bits to his own ideas of size. The result was that the first thing a purchaser of an auger bit had to do was to file his new tool to fit his brace socket. This created a demand for an adjustable socket or chuck to the brace. Spofford met this by patenting in 1859 the brace shown in Figure 58, having a split socket which, by means of a thumbscrew, gripped any size and taper of bit tang. It did not sell very extensively until John S. Fray and Horace Pigg purchased the patent in 1866 and popularized it. That the idea was a good one is evidenced by the fact that the brace is still on the market. The Stanley Company, and probably other manufacturers, still catalog it.

The first true shell-type chuck was brought out by Barber in 1864. See Figure 59. It has been the most popular chuck on the market ever since. All large brace manufacturers make it, though each one has some pet modification. It is, however, basically the same original idea of Barber's. Another chuck that all brace makers manufacture is the Fray chuck, Figure 60. It came out sometime after Barber's, and has likewise survived, because no one could devise a better one for its particular purpose. The Fray chuck holds only square-tang bits, and probably does it better than any other chuck made. The Barber chuck holds either a square or round object, and does both well.

The first United States patent on a ratchet brace was taken out in 1868, and others followed. However, it is doubtful if the new ratchet brace was generally accepted by the public, for there seems to be no firm claiming to have manufactured it before the 80's. Probably the ratchet was at first looked upon as a frill, or as belonging to a special-purpose tool and, of course, many braces, like the Spofford, continued to sell that did not have this convenient means of working in a tight corner.

The use of ball bearings has probably been the most recent important change in the design of the brace. The better braces now have ball races under the heads, in the center handles, and even in the chucks. Such improvements are, probably luxuries pure and simple, like the polished plating to the metal, and the beautiful rare wood in the handles, and hardly can be properly called real improvements. They are not ever likely to become universal.

The bit brace has probably had more attention by inventors in recent years that any other tool in the woodworker's kit, unless it is the plane. When a writer tries to sift out those that should receive attention in a history such as this, he sees the wisdom of the Greek sage who said, "Count no man great until he is dead." Paraphrasing this, it may be said, "Count no patent an improvement until it has expired."

Papermaking

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A related-subjects lesson for the printer, put across with a punch.

PAPER can be made from a great many vegetable fibers, the latest added to the list being cornstalks. The most commonly used fiber is wood. The better grades of paper are made from linen and cotton fibers, usually obtained from cotton mills. Spruce and hemlock are the woods best adapted to the manufacture of paper.

Before the papermaking machine was invented in the year 1804, all paper was made by hand. The first paper is said to have been made from bamboo and rag fibers by the Chinese about 105 B.C.

Figure 1 pictures the first step in the process of papermaking. Trees are felled in the northern forests, and after being sawed to 4-ft. lengths, are piled on the frozen streams. The spring thaws then carry them down to the deeper water.

The logs are then transported to the mill storage yard, where they are stacked up in great piles, often 20 ft. in height, as shown in Figure 2. The bark is removed from the logs by rolling them over each other. Streams of water are played upon them to wash away all dirt and bark.

After the bark and knots have been removed, the log is fed against a large revolving drum upon which huge knives are mounted. This process, which cuts the log into small chips, is shown in Figure 3. The chips are screened to remove all chip dust, after which they are taken to the "digesters."

In great tile-lined digesters, such as

Fig. 1. Securing the logs

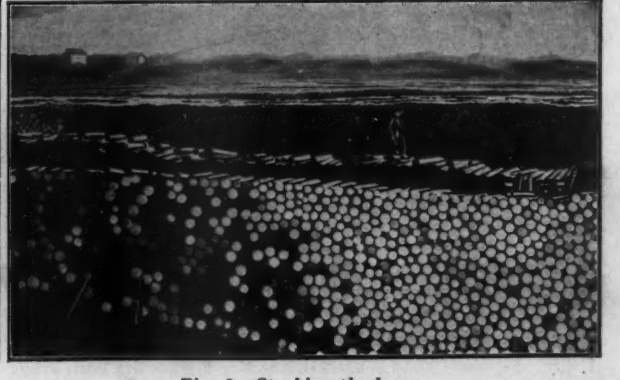

Fig. 2. Stacking the logs

Fig. 3. Cutting the log into chips

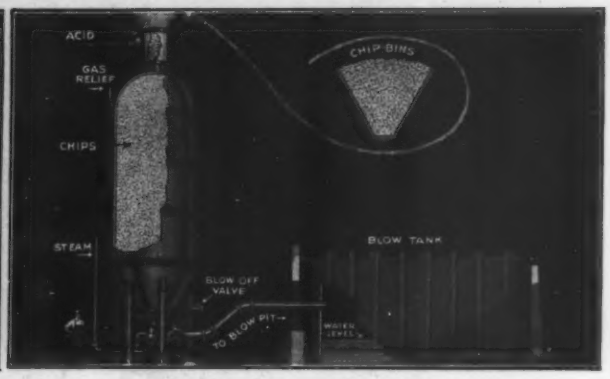

Fig. 4. The digester

the one shown in Figure 4, the chips are cooked with calcium bisulphate and steam, so that all rosin and other binding materials are dissolved, thus liberating the cellulose fibers.

The pulp is then run over the riffle pictured in Figure 5, where all small knots, fragments of bark, and dirt are removed. After about 12 hours, all foreign substances have been taken out, leaving the pure cellulose. The pulp is then bleached with chloride of lime.

The pulp is next run into "laps" on the machine shown in Figure 6. This is done for convenience in grading and storing.

To make the fibers of the pulp suitable for papermaking, they must be thoroughly mixed with water, coloring matter, and rosin size in "beaters." This process is further carried on in the refining engines, where the pulp is given a continuation of the treatment started in the beaters.

After leaving the refining engine, the pulp, diluted in a large quantity of water, is allowed to flow onto the continuous belt of wire screen, of the Fourdrinier papermaking machine. As this screen moves along, it is continually shaken. This not only causes the water to drain off, but lays the fibers of the pulp both crosswise and lengthwise of the sheet, thus forming a wet sheet made up of millions of tiny fibers adhering to each other. The paper is then carried between heavy rollers which compress it, and then run over and under heated cylinders until it is thoroughly dried. The proper finish is then given to the paper by being pressed between two "calender" rolls at the end of the machine. The finished paper, traveling at a speed of about five miles an hour is wound on rolls.

To cut the finished paper into flat sheets, the rolls are placed on large cutting machines which cut the several thicknesses of paper at one time. The sheets are made slightly larger than finished size. This process is shown in Figure 9.

From the cutters, the paper passes to the finishing room, where it is in-

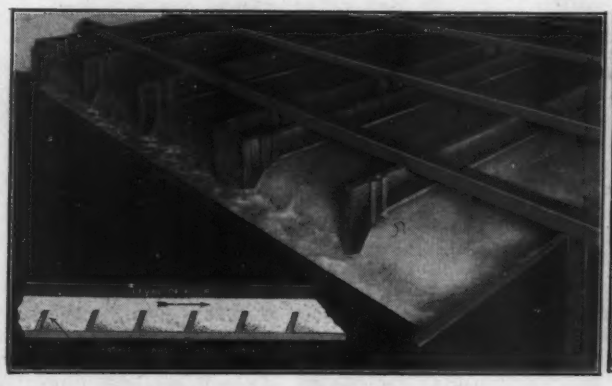

Fig. 5. The riffle

Fig. 6. Running the pulp into laps

Fig. 7. The beaters

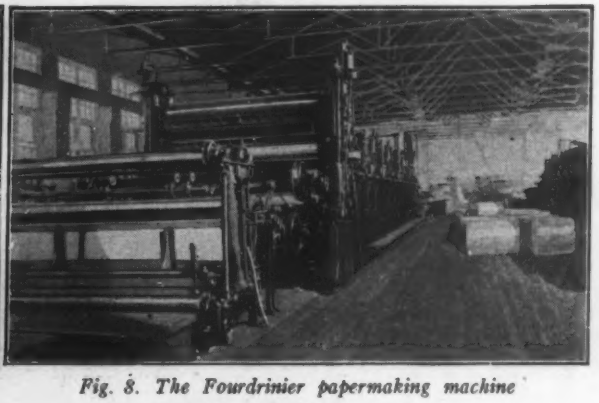

Fig. 8. The Fourdrinier papermaking machine

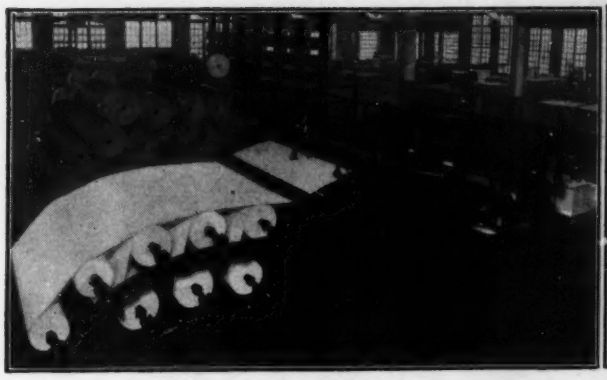

Fig. 9. Cutting machine

Fig. 10. The inspection room

spected and all imperfect sheets removed. The sheets are then counted and packed in cases for delivery.

To *watermark* paper, it is passed under a "dandy roll" on which a design or lettering is raised in very thin wire. The wire is pressed into the pulp as the paper passes under it, making the sheet thinner at that place. Watermarks may be readily seen in bond paper, writing paper, and some book paper by holding the sheet to the light.

Glossary of Papermaking Terms

A *deckle edge* is made by directing a stream of water on the edge of the pulp sheet as it passes through the machine. This gives the paper a feathered edge.

Kinds of paper. There are many different kinds and styles of paper on the market today — so many, in fact, that it is impossible to mention them all here. The most frequently used, however, are as follows:

Newsprint is one of the cheapest grades of paper. It is made almost entirely of wood pulp. This paper stock is used chiefly for printing newspapers, circulars, posters, and kindred work. Newsprint is obtainable in both sheet and roll form, the latter being used on rotary newspaper presses.

Book paper is divided into several classes, the most frequently used being machine finish, supercalendered, enameled, and antique.

Machine-finish book paper is usually made of sulphite-soda pulp, and is the least expensive of book papers.

Supercalendered book paper has a gloss finish, and is made of practically the same materials as machine-finish stock.

Enameled paper is coated with a mixture of clay and casein glue, which gives a very high finish to the surface. This paper is especially adapted to the printing of fine-screened halftones.

Writing papers consist of ledgers and bonds, and are made to take ink suitably. These papers are usually made of sulphite and spruce wood. Bond papers are used for stationery, and ledgers, being heavier, are used for blank-book sheets.

Cardboard is usually made from wood and straw. Some cardboards are made the required thickness on the machine, while others are made up of sheets of paper pasted together, the number of sheets being indicated by the thicknesses, as 2-ply, 3-ply, 5-ply, etc. Index cards, signs, window cards, and a multitude of other printed matters require cardboard.

Cover papers are usually heavier, softer, and rougher than other paper stock. The most popular are antique, laid, ripple, plate, wove, and plate finish. As indicated by the name, cover papers are used for covers on booklets, menus, and like work where stiffness, durability, and beauty are required.

Laid paper is watermarked with lines running with the grain of the sheet. *Wove* paper has fine lines running in both directions.

Standardization of papers. One thousand sheets of paper is the basis of count and weight of printing papers. The *substance weight* is the weight of 1000 sheets, and is indicated after the size of paper listed, as 25 x 38 — 100. That is, 1000 sheets of the listed stock weigh 100 pounds. If 1000 sheets weighs 40 pounds, it is called substance 40; if it weighs 32 pounds, it is substance 32, and so on.

Sizes of paper stock. The standard sizes of paper stock are as follows: Book paper, 24 x 36, 25 x 38, 26 x 29, 32 x 44, 35 x 45½ and their doubles; bonds, ledgers, and writing papers: 16 x 21, 17 x 22, 17 x 28, 19 x 24, and their doubles.

Supplementary Readings

Gress — *Handbook of Printing*, pages 131 to 136 (historical).
Hackleman — *Commercial Engraving and Printing*, pages 625 to 649.
Watt — *Art of Papermaking.*
Wheelright — *From Papermill to Pressroom.*
U. T. A. Lessons, No. 13.

Plates used in this article, furnished by courtesy of the Hammermill Paper Company, Erie, Pennsylvania.

Fig. 11. A paper-mill warehouse

Fig. 12. Birdseye view of a paper mill on the shore of Lake Erie

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

Coming Events Cast Their Shadows Before

A number of the larger industrial plants scattered throughout the cities of this country are feeling the first feeble pulsations of the new life which promises the beginning of a new cycle of prosperity. It is truly gladdening to hear from one man that a shop in his city has put on 500 more men, while another says "Yes, I have heard that so-and-so's plant at New York, Chicago, Detroit, or elsewhere, has hired a thousand men." In many plants, for the first time in years, the almost abandoned "Men-Wanted" blackboard in the employment office has been hung out with the cheerful news that a certain number of operators for this or that special production machine are wanted.

Despite the fact that this increase of employment means little when compared to the grand total of unemployed in the country, nevertheless there are startling indications that presently there will be an unheard-of shortage of skilled mechanics for certain of the more exacting tasks which our present-day production methods have made so imperative.

As far back as the middle of 1933, Kenneth Coolbaugh, of the Department of Labor and Industry, Pennsylvania, reported that at a meeting of employment men, statements such as the following were common: "I wish I knew where I could lay my hands on 75 good sheet-metal men at once." And again, "If the shipbuilding industry has a turn of 20 per cent for the better, I will be on the road again as I was in 1931, advertising in a half dozen cities for skilled mechanics and advancing transportation to everyone that looks good." And, "Believe me, we didn't haggle over the 15 cents an hour difference between what he wanted and I offered. With $300,000 tied up in one machine waiting for the juice to be turned on, the general manager told me to wire him to come at once, and to wire us collect when he would arrive."

A writer in *Business Week* some months ago, called attention to the fact that the machine-tool-industry business for 1934 had been considerably better than for any year since 1931. He stated that many of the machine builders themselves are ordering equipment in preparation for the time when business again picks up. He also quoted an authority in this field, to the effect that if a sudden upturn materialized, there would be such a shortage of skilled mechanics that it would be impossible to promise prompt shipments, no matter how necessary.

A little reflection on the foregoing will show that all these statements have a basis in actual conditions. For the last four years many of the older mechanics have died. Others have moved to remote cities. A small percentage have gone into other lines of work. The vacancies thus left were not filled because there was no necessity that demanded it. During all this time, but a paltry few apprentices were hired and trained. Now at the dawn of the new era, industry is beginning to see the handwriting on the wall. As yet, however, it is powerless to do much about it.

The executive order signed by President Roosevelt on June 27, 1934, which launched a far-sighted program of apprenticeship training, shows how industry and the schools can effectively co-operate in the training of our future workers. It is well for teachers of vocational education, and even of industrial arts, to realize that this broad-gauge plan of apprenticeship training is really an educational program, and that it combines practical training obtained in industry, with a well-planned addition of technical and general education furnished by the school.

The young man who is entering an apprenticeship, it must be understood, is making a very important step. For this reason, the school must assist him in getting all the necessary information about the trade in which he is interested. It is here that the industrial-arts teacher and the entire junior-high-school program can be especially helpful to the prospective apprentice. Besides giving him information about the trade, the student should be shown that the approval of the state committee on apprenticeship makes him virtually a ward of the Federal Government, which will see that the employer will teach the learner the whole trade for which the latter has indentured himself. It must be impressed on the student, however, that the contract also binds him to serve the full time of his apprenticeship during which he will earn an average wage approximating about 50 per cent of the basic wage rate paid the journeyman. It is this last phase especially, which makes vocational guidance with regard to prospective apprentices so necessary, because if the student has made a wrong choice, he will have practically wasted four of the best years of his life in fulfilling a contract which he has entered, the while working for less wages than he might have obtained otherwise.

According to William S. Patterson, Executive Secretary of Apprentice Training, forty states have already established state committees on apprenticeship training to carry on this work of adequately preparing our future skilled workers. It is necessary, therefore, that all shop teachers thoroughly inform themselves about this important movement in their own states. In practically every case, the state director of vocational education, or of trade and industrial education, is the chairman of the state committee. By getting in touch with these state officials, therefore, teachers can acquaint themselves how best they can co-operate in making this gigantic plan of training the future worker of America effective.

Measuring and Grading Lumber

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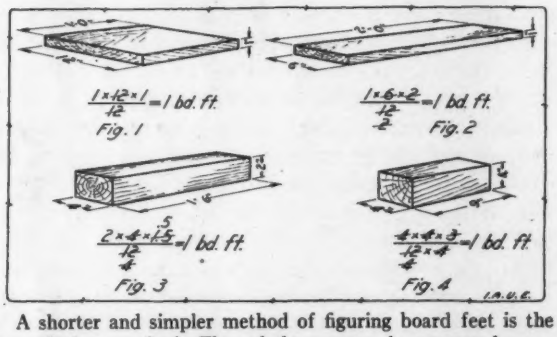
A very helpful related-materials lesson for the teacher of woodworking.

Board-Foot Measure of Lumber

LUMBER is measured by three methods. The most common unit of measure is the board foot. All lumber of an inch thickness or greater which has not undergone special processes of manufacture is measured in this way. A board foot is one inch thick, twelve inches wide and one foot in length, or its equivalent, as shown in Figures 1, 2, 3, and 4.

There are two methods of figuring board feet — the long, and the short or cancellation method. It will be noticed that the width and thickness of lumber are expressed in inches, while the length is expressed in feet. This is the usual method of expressing dimensions of lumber — 1″ × 6″ × 10′ — one inch thick by six inches wide by ten feet long.

By the long method the width in inches is multiplied by the thickness in inches and the product is then divided by twelve, since there are twelve inches in a foot. This figure is then multiplied by the length in feet, and the product is the number of board feet in a piece of lumber. Let us illustrate: How many board feet are there in a piece of lumber which is 1 in. thick, 6 in. wide, and 10 ft. long?



A shorter and simpler method of figuring board feet is the cancellation method. The whole process is expressed as a fraction, in which the numerator has three figures — the thickness in inches, times the width in inches, times the length in feet. The denominator is 12. We may express this by the formula:

$$\frac{T' \times W' \times L'}{12}$$

For example, use the same dimensions as in the problem illustrated above — thickness, 1 in., width, 6 in., and length, 10 ft. Using the formula, we have:

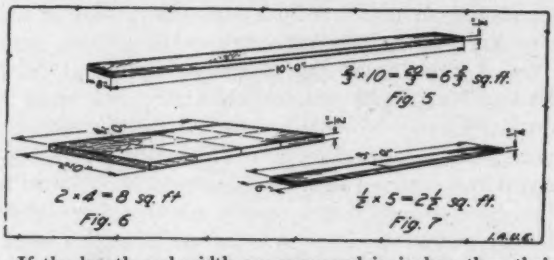
$$\frac{1 \times 6 \times 10}{12} = 5 \text{ bd. ft.}$$

$$12\overline{)6} \quad \times 10 = 5 \text{ bd. ft.}$$

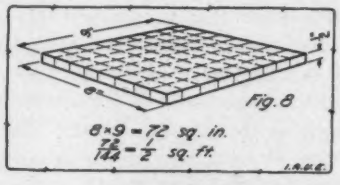
The result is the same by either method, but the short method is quicker and easier after it is mastered.

Square-Foot Measure of Lumber

A second unit of measure pertaining to lumber is the square foot, which is a piece of lumber 12 inches wide and 1 foot long, or its equivalent, regardless of thickness. Lumber thinner than 1 inch, such as veneer, plywood, and siding, is usually sold by this unit of measure. This is because the cost of making thin lumber is out of proportion to its thickness, due to the great waste and because there are extra processes of manufacture required. The formula for figuring the number of square feet is W′ × L′, which reads, width in feet times length in feet. For illustration, in a piece of lumber ½ in. thick, 8 in. wide, and 10 ft. long the number of square feet would be figured in this way. Disregard thickness, or regard thickness always as 1 in., and express the 8-in. width as 2/3 of 1 foot and multiply width in feet by length in feet, as given in the formula, thus: 2/3′ × 10′ = 6 2/3 square feet. See Figures 5, 6, and 7.



If the length and width are expressed in inches, then their product would have to be divided by 144, since there are 144 square inches in one square foot. See Figure 8.



Linear Foot

A third unit of measure of lumber is the linear foot. This is simply one foot in length, regardless of thickness or width. All millwork, such as moldings, quarter- and half-rounds, casings, jambs, stops, baseboards, etc. (see Fig. 9), are sold by this unit of measure. Lumber sold by the linear foot has been subjected to special processes in its manufacture to meet certain needs, and as a result it is not of uniform width or thickness, which would make it difficult to figure board or square feet. The labor and machine work required cause the price to be higher than standard lumber. Matched flooring, wainscoting, and drop siding, however, even though they require extra processes of manufacture, are sold, nevertheless, by the board foot because a large portion of their thickness is of standard measure.

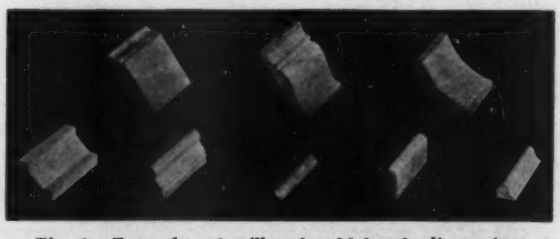


Fig. 9. Examples of millwork sold by the linear foot

Special Units of Measure

There are also certain special units of measure. Shingles are sold by the square, which is an area 10 feet square, or 100 square feet. Four bundles of shingles will cover one square. The price is quoted at a certain figure per square, but smaller lots — bundles — can be purchased. Lath is sold

and the price is quoted by the thousand laths. Here again, they are packed in smaller lots — bundles of 50 — and may be purchased in the smaller quantities at proportionate prices. Lath is made in 32- and 48-in. lengths, thus making it of correct length for use on studding which is placed 16 or 24 in. apart. Posts are measured by their length and the diameter of the small end.

Lumber is usually sold by the thousand feet, of whatever unit of measure used, except the special units. One thousand feet is expressed by the symbol "M," which is the Roman numeral for one thousand. Thus, we may say that lumber is $78 per M. Prices are quoted for this amount, and when smaller quantities than 1,000 feet are desired, the price is figured proportionately. For instance, 100 feet of lumber priced at $125 per M would cost $12.50, figured thus:

$$\frac{100}{1000} \times 125 = \$12.50$$

Cost of Lumber

Cost of lumber is affected by several factors, of which the principal elements are the kind of wood, quality of lumber, special processes of manufacture required, and unusual sizes.

Kinds of wood vary in value, depending upon scarcity, cost of securing it, natural color and beauty of grain, and special suitability for certain uses. To illustrate, walnut is found in very limited quantities scattered over a wide area, and therefore is expensive to secure; it has a very attractive color and grain, which together with its scarcity, compels that its use be limited to such purposes as furniture, gunstocks, and other articles whose value is high compared with the amount of wood used. The same considerations apply to oak, maple, and similar woods, although those of which we have a greater supply have a correspondingly wider range of uses. On the other hand, such woods as Douglas fir, yellow pine, and hemlock are comparatively cheap, due to their relatively plentiful supply; and because they lack special characteristics of grain, color, and strength, they are used for general building purposes and in many industries.

Quality of lumber, which will be discussed later in this chapter, also affects price. High quality of any kind of lumber is worth more than poorer quality of the same kind of wood.

Special processes of manufacture also cause an increase in the cost of lumber. Such processes may be illustrated by the cutting of the tongue and groove in matched flooring, wainscoting or beaded ceiling and drop siding, or by the millwork items, such as moldings, window and door casings, jambs, window stops, and baseboards. These different kinds of lumber and many others require one or more extra machine processes and more labor in their manufacture. There is also more waste in making them, all of which cost money. It is estimated that millwork adds 30 to 35 per cent to the cost of ordinary lumber of similar size.

Unusual sizes of lumber, either large or small, also command a premium price. In cutting very small sizes of lumber there is more waste proportionate to the amount of finished lumber produced, and this waste must be paid for in the price of the finished product. In sawing large sizes of lumber, selected logs only can be used in order to secure good lumber of unusual width or length. As a result, boards 14 in. wide or wider and those of length greater than 14 ft. are priced higher per M than those of smaller sizes. Lumber over 14 ft. in length and including 20 ft. is usually $2 per M higher than standard lengths. That over 20 ft. in length commands a premium of $5 per M.

Surfacing of Lumber

In former days, lumber, except that used for finishing, was usually sold rough; that is, just as it comes from the saws. At the present time, however, it is usually surfaced at the mill; that is, it is planed smooth, on one, two, three, or four sides. This is indicated by the symbols S2S, S4S. S2S means surfaced on two sides, while S4S means surfaced on all four sides. This surfacing is done for several reasons. It reduces the cost of transportation, since a board which is surfaced is lighter and smaller than a board that is rough. Depending upon the size of the lumber, from 10 to 30 per cent of the volume, and therefore weight, is removed by surfacing. Surfaced lumber is easier to handle, and many builders prefer to use it because it reduces the manual labor that must be done on the job. In addition to surfacing, the arrises on 2-in. lumber are sometimes eased, that is, slightly rounded to further facilitate convenience in handling and to prevent slivering. Size of lumber is figured in the rough state. Consequently, due to surfacing, a board, the thickness of which is given as 1 in. is really 13/16 or ⅞ in. thick, and a 6-in. board is really 5⅝ or 5¾ in. wide. This is the standard loss due to surfacing — ⅛ or 3/16 in. in thickness, and ¼ or 3/16 in. in width. There is no loss in length; in fact, most lumber is cut a little longer than its given dimension indicates.

Standardization of Lumber Dimensions

Lumber dimensions are standardized, due to (1) popular demand, (2) the action of lumbermen's associations, and (3) the recommendations of the United States Department of Commerce. The standard sizes of lumber vary in width by 2-inch units from 2 inches up — 2 in., 4 in., 6 in., etc., and in length by 2-foot units from 6 feet up — 6 ft., 8 ft., 10 ft., 12 ft., etc. By establishing these standards, larger quantities of each standard size can be made, eliminating the extra cost of making smaller quantities of many more sizes; the retailer is saved the overhead of carrying much more lumber of many more dimensions; and the consumer may know exactly in what sizes he can conveniently buy lumber. For special purposes, such as are required in many industries, pattern-making, and cabinet and furniture work, odd and unusual sizes are manufactured.

Grading of Lumber: Reasons

Since lumber sawed from logs varies widely in quality, some method of grading must be used in order that the consumer of lumber may specify the quality which he may use to advantage for his particular purpose. High quality lumber which is free from natural and manufacturing defects is more valuable than poorer lumber, and it is wasteful to use a quality which is better than is required by a given job. Consequently, the use to which lumber will be put is an important factor in its grading by the manufacturer. Other factors in grading are appearance and strength. For example, sheathing and subflooring may have many defects, since both are entirely covered by finishing material. On the other hand, window sash, doors, and other pieces which will be visible on both sides must be free from defects, especially if the wood will be given a natural finish. Lumber used for siding and flooring may have defects on one side, but the other side, which will be visible, must be clear. Defects on one side will not be seen, and ordinarily will not affect the wearing qualities of the wood. Lumber which will be painted may contain more defects than lumber which will be varnished, since paint will hide some defects.

Grading Hardwood Lumber

The National Hardwood Lumber Association has fixed the rules for the grading of practically all kinds of hardwood lumber. The grade classification is based upon the amount of clear, usable lumber in a piece, rather than upon the number or size of the defects present. Ordinarily one side, or face, must be clear, which means free from all defects, and the other face must be sound, which means free from rot, heart-center, shake, and other defects which materially impair the strength of the usable piece.

The highest grade of hardwood lumber is known as "Firsts" and the next is called "Seconds." These two grades are nearly always combined and are designated as "FAS," meaning firsts and seconds. In firsts it must be possible to cut 91 2/3 per

cent of the surface measure into clear face material, and in seconds, 83 1/3 per cent of the surface. Also, in both these classes the pieces cut must be not less than 6 in. wide and 8 ft. long. As mentioned before, these two grades are usually combined as "FAS." The third grade is termed "Selects" and calls for 91 2/3 per cent clear face in pieces with 2 and 3 surface feet, with the reverse side sound. Lower grades are No. 1 Common, No. 2 Common, Sound Wormy, No. 3A Common, and No. 3B Common, in which are allowed increasingly large amounts of defects. No requirement of strength is made. In addition to these grades, each different lumber is graded as to its use — flooring, doors, sash, interior trim, furniture, cabinet, automobile body, etc. Thus there are many grades which are of interest only to the particular user of each kind of hardwood lumber.

Grading Softwood Lumber

Softwood lumber is graded under many different sets of rules, made by different manufacturers and made for each kind of wood according to its intended uses, but the tendency is to standardize all grading methods. It would require many pages to give all the rules for the grading of one kind of softwood lumber.

The basis in softwood lumber grading is not the percentage of clear-face material in a given piece, as in hardwood, but

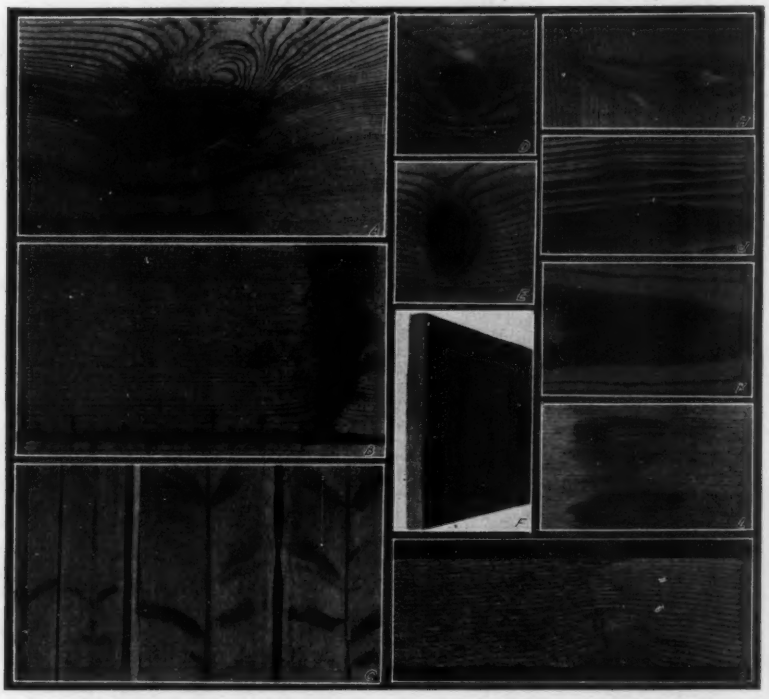


Fig. 10. Lumber defects. A. Encased knot. B. Spike knot and pith. C. Knots (spike, round, and oval) at pith. D. Loose knot. E. Intergrown knot. F. Shake. G. Torn grain — a manufacturing defect. H. Spike knot. J. Pitch pocket. K. Pitch streaks. L. Rot

is the number and kinds of defects which may be present. The most common defects (see Fig. 10), specified in softwood grading rules are knots, stain, shake, wane, rot, pitch, splits, seasoning, checks, and manufacturing defects. The grade is determined on the better side of the piece, except when it is to be used for work both sides of which will show, as in doors, and then the poor side is used for grading.

Softwood lumber is divided into three main classes: (1) Yard lumber, which is less than 5 in. thick and is intended for general building purposes; (2) structural material, which is 5 in. or over in thickness, and which is graded on strength and on use of the entire piece; and (3) factory and shop lumber, which is intended to be cut up for further manufacture. The basis of grading for this class is the area of each piece suitable for cuttings of a certain size and quality.

Total products of a typical log arranged in series according to quality as determined by appearance	Select—of good appearance, which will look well when finished	Suitable for natural finishes	Grade A	Practically free from defects
			Grade B	Allows a few small defects or blemishes
		Suitable for paint finishes	Grade C	Allows a limited number of small defects or blemishes that can be covered with paint
			Grade D	Allows any number of defects or blemishes which do not detract from the appearance or the finish, especially when painted
	Common—contains defects or blemishes which detract from the appearance of the finish, but suitable for general utility and construction purposes	Suitable for use without waste	No. 1 Common	Sound and tight-knotted stock; size of defects and blemishes limited; may be considered watertight lumber
			No. 2 Common	Allows large and coarse defects; may be considered grain-tight lumber
		Permitting waste	No. 4 Common	Allows larger and coarser defects than No. 2 Common, also occasional knot holes
			No. 5 Common	Must hold together under ordinary handling

It is the first of these classes, namely, yard lumber, in which we are most interested. The above table gives the basic-grade classifications for softwood yard lumber.

The average lumberyard does not carry a complete stock of all grades of hardwood or softwood lumber since it is not profitable for them to keep lumber on hand for which there is not a steady demand. In many communities the retail supply of hardwood lumber is very limited and only rarely is a lumberyard found whose retail sales warrant carrying a complete stock. Softwood yard lumber is intended for general building use and as with hardwood lumber, not all grades are in constant demand. For the average residence or frame building, D select lumber is the best that is used; consequently, few yards carry a better grade. On the other hand, due to the limited demand for the poorer grades of softwood lumber, Nos. 4 and 5 common are rarely carried in stock.

The other two general classes of softwood lumber — structural material and shop lumber — are used in general only by those people who are thoroughly familiar with their uses and requirements, and a description of their grades is not necessary for the ordinary consumer of lumber.

Glossary of Major Lumber Defects

A *check* is a lengthwise separation of the wood, the greater part of which occurs across the growth rings.

Decay is disintegration of the wood substance due to the action of wood-destroying fungi.

Discoloration or *stain* is due to weathering, chemical action, or the action of fungi.

Imperfect manufacture includes all defects or blemishes which are produced in the manufacturing processes, such as chipped grain, torn grain, loosened grain, nonuniform width or thickness, skips in dressing, mismatching, miscut, machine gouge, machine burn, and insufficient tongue or groove.

A *knot* is caused by sawing across or lengthwise of a limb which has grown out from the tree. As to form, they may be classified as round, oval, and spike knots. The shape of the knot is determined by the angle of the saw cut across

the limb. As to size, they are classified as pin, small, medium, and large knots. With reference to occurrence, they are known as single knots, knot clusters, and branch knots. From the standpoint of quality, knots are classified as sound, unsound, decayed, tight, loose, intergrown, encased, water-tight, pith, and hollow.

A *pitch streak* is a well-defined accumulation of pitch in the wood cells in a more or less regular streak.

A *pitch pocket* is a well-defined opening between annual layers of growth usually containing solid or liquid pitch.

Pith is the small soft core occurring in the structural center of a log.

A *shake* is a lengthwise separation of the wood, the greater part of which occurs between the growth rings.

Wane is bark or the lack of wood from any cause on the edge or corner of a piece.

A Course of Study for Upholstering

D. C. Marshall

Manhattan, Kansas

FREQUENTLY upholstering is not made a part of school-shop work because little attention has been paid to it from the standpoint of its relation to the course in woodwork in the smaller schools. The course of study for upholstering presented herewith is developed so that it can be used as a continuous course, or units of work may be lifted from the course and used as a part of the woodworking. This is a valuable feature when considered from the viewpoint of the teacher in the small school.

All of the common types of upholstering are included in this course. The different types of work are offered in the order of their degree of difficulty so that the student may progress to more difficult types as his skill increases.

The following books are recommended to furnish supplementary reading to accompany demonstrations by the instructor.

Johnson, *Furniture Upholstery* (Manual Arts Press, Peoria, Ill.)

Bast, H., *Essentials of Upholstery* (Bruce Pub. Co., Milwaukee, Wis.)

Worst, E. F., *Problems in Woodwork* (Bruce Pub. Co., Milwaukee, Wis.)

Hjorth, Herman, *Principles of Woodworking* (Bruce Pub. Co., Milwaukee, Wis.)

Fabrikoid Division, *Home Upholstery* (E. I. Dupont de Nemours & Co., Inc., New York City)

I. Tools
  A. Hammers
    1. Magnetic
    2. Plain
    3. Magazine
  B. Webbing stretchers
    1. May be made in the school shop
  C. Shears
  D. Needles
    1. Regulators
    2. Straight double-pointed
    3. Curved

II. Materials
  A. Webbing
    1. Grades
  B. Springs
    1. Double-knotted cushion seat
    2. Open-end
    3. Bar springs
    4. Cushion spring units
  C. Twine
    1. Spring twine
      a) Grades suitable for spring work
    2. Stitching twine
      a) Grades and use of each
  D. Spring covers
    1. Burlap
    2. Canvas
  E. Padding
    1. Tow
      a) Source and composition
      b) Use
    2. Moss
      a) Source
      b) Preparation
      c) Use
    3. Hair
      a) Kinds
      b) Source
      c) Use
    4. Cotton
      a) Sheet and felting
      b) Source
      c) Use
    5. Excelsior
    6. Kapok
      a) Source and use
  F. Coverings
    1. Leather
      a) Market grades
    2. Leather substitutes
      a) Grades of substitutes
      b) Process of manufacture
    3. Textiles
      a) Mohair
      b) Tapestry
      c) Velour
      d) Velvet
  G. Dust cloths or covers
    1. Cambric
    2. Sateen
  H. Padding covers
    1. Ticking
    2. Muslin
    3. Canvas
  I. Gimp
    1. Leather gimp
    2. Silk gimp
  J. Tacks
    1. Cut tacks
    2. Wire tacks

The student should be able to distinguish the different kinds of tacks, know the use of each, and how to determine the size.

  K. Nails
    1. Paper head
    2. Metalene
    3. Ornamental or fancy heads

It is not expected that the student will make a detailed study of upholstering materials except in those schools where a special course in upholstering is offered. The foregoing outline may be used, however, for making assignments in supplementary reading in connection with a project. A collection of materials will do much to aid the class in gaining an understanding of their nature and use. Companies dealing in upholstering materials will usually furnish these samples free.

Upholstering the Finished Piece

I. Board structure
  A. Types of furniture
    1. Footstool
    2. Chair seat
    3. Leg rest
  B. Steps in upholstering
    1. Preparation of the padding
    2. Attaching padding covers
    3. Placing the cover material
    4. Trimming with gimp

II. Open frame without springs
  A. Type
    1. Chair seat
  B. Steps in upholstering
    1. Webbing the frame
    2. Placing the padding
    3. Rolling the hard edge
    4. Attaching padding cover
    5. Stitching
    6. Covering
    7. Trimming with gimp

III. Upholstering on springs
  A. Types
    1. Chairs
    2. Davenports
    3. Settees
  B. Steps in upholstering
    1. Webbing or placing spring strips
    2. Stitching of springs if webbing is used
    3. Tying of springs
      a) Clove hitch knot
    4. Covering springs
    5. Applying the rolled or spring edge
    6. Padding
    7. Covering of padding
    8. Stitching
    9. Covering
    10. Trimming with gimp where necessary
    11. Placing of dust cloth under seat

IV. Spring edge work
  A. Types
    1. Modern davenports
    2. Overstuffed furniture
  B. Steps in upholstering
    1. Webbing or bar springs
    2. Attaching spring to webbing
    3. Placing of spring wire around edge
    4. Tying springs
    5. The spring cover
    6. Padding and forming roll or spring edge
    7. Padding cover
    8. Stitching of padding
    9. Covering
      a) Fitting cover
      b) Preparation of welt
        (1) Welting cord
        (2) Welting strip
      c) Sewing of welt
      d) Nailing of cover
    10. Trimming with gimp where necessary
    11. Dust cover under seats and on backs
V. Spring filled cushions
  A. Types
    1. Overstuffed chair cushions
    2. Settee cushions
    3. Coxwell chair cushions
  B. Materials
    1. Nachman spring units
    2. Padding
    3. Cover case
  C. Steps
    1. Placing padding over springs
    2. Making of cover case
      a) Cutting to size
      b) Making a welt
      c) Stitching
    3. Placing springs and padding in cover case
      a) Use of a cushion filler
    4. Stitching of back opening

Fairview High School, Dayton, Ohio

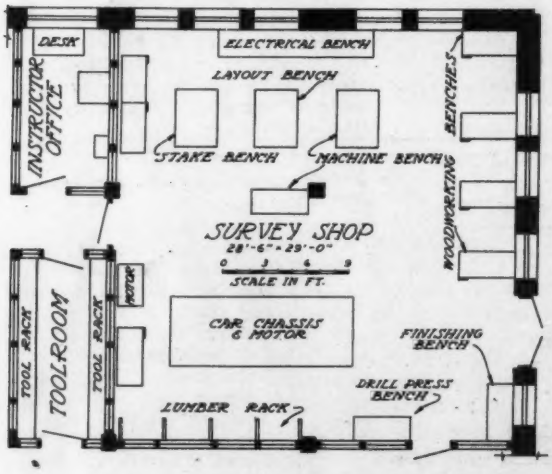
Industrial Arts at Fairview

Geo. C. Decker

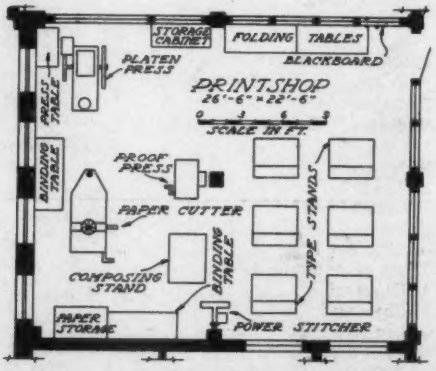
Fairview High School, Dayton, Ohio

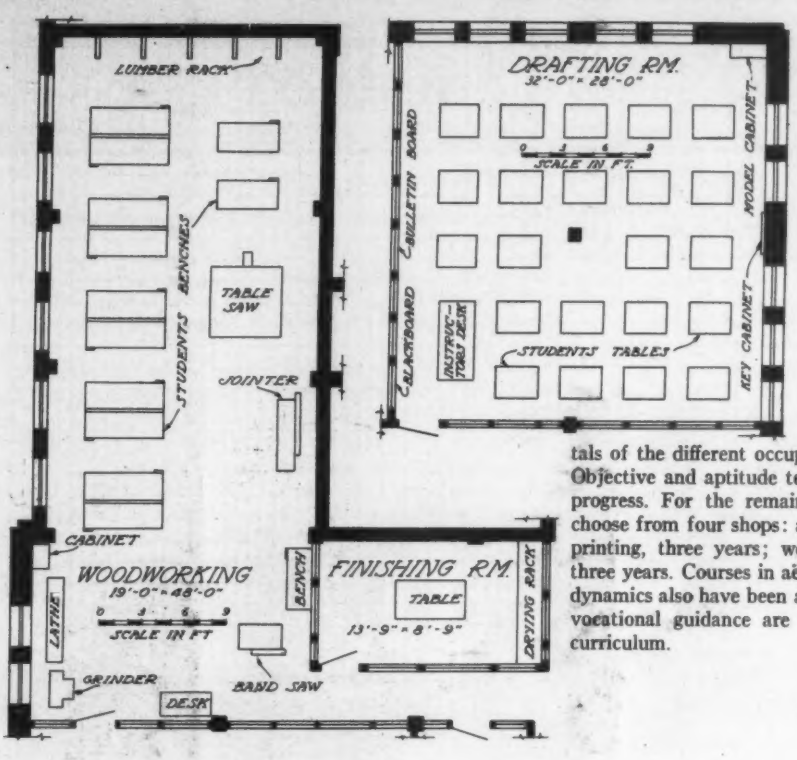
Industrial-arts work offered in a high school located in the residential district of a suburb to a city of many industries.

FAIRVIEW High School is located in Harrison Township, a suburb of Dayton. This beautiful school was completed and first occupied in the fall of 1929. The total enrollment is about six hundred students coming from a fine residence district. The faculty is composed of specialists in each department, and this is one of the few high schools to have men make up fifty per cent of the faculty.



The industrial-arts department is in a wing of the building and on the first floor. There are five shops. These shops are to meet the demand of a semiprofessional community of strictly industrial surroundings. The average income of this community, in normal times, was two hundred dollars a month per family. This guarantees each boy who is interested in mechanics a semiprofessional, or professional, education in his chosen field. The school shops are organized to test and develop the interests and aptitudes of boys in mechanics, to prepare boys for entry into industry and to enable them to con-





tinue their technical education after finishing their high-school studies.

The first-year-survey shop is for freshmen only, who are interested in the mechanical industries. Here each boy is rotated through five units of work during the school year. These units are sheet metal, electricity, bench metal, auto mechanics, and woodwork. Each unit is equipped for four or eight boys at a time. After seven weeks, each group is rotated to the next unit. A graduated series of projects with drawings, models, and instruction sheets, aid in teaching fundamentals of the different occupations covered by the various units. Objective and aptitude tests are used as a means of checking progress. For the remaining three years, the students may choose from four shops: an advanced course in general metal; printing, three years; woodwork, three years; and drafting, three years. Courses in aëronautics, airplane motors, and aërodynamics also have been added. Related shop mathematics and vocational guidance are a part of each industrial student's curriculum.

Auto Electrical Jobs

Daniel Shirck

St. Paul, Minnesota

THE course analysis for auto electricity presented herewith is the result of ten years' teaching experience and three years' experience in the trade. The jobs are arranged in groups covering all the electrical equipment on the auto. The divisions are as follows: Preliminary, storage batteries, battery ignition, magneto ignition, lights, generators, starters, horns, and electrical accessories. The groups are subdivided into three parts: bench tests, trouble shooting, and service.

No two instructors would offer an "auto electricity" course in exactly the same way, or with the same sequence of jobs, or cover the same amount of work, because the type of student or kind of equipment usually differs. However, the jobs are so arranged that the individual instructor may select the jobs suitable to his equipment, to his type of student, and to the length of his course.

Suggestive Ways to Use the Chart

1. *As a junior-high-school course.*
   Jobs 1 to 14 inclusive, 18, 19, 22, 38, 63, 71, 76, 79, 82, 87, 94, 120, and 142.
2. *As a senior-high-school course.*
   First semester: Jobs 1 to 75.*
   Second semester: Jobs 76 to 150.*
3. *As a short-unit course.*
   A student could specialize in one or more groups as, for example, in storage batteries. Each Job could be repeated until he became skillful in its performance.

*Some service jobs on the automobile would have to be omitted, and many could not be repeated for gaining experience.

The analysis and progress chart which accompanies this article will be found very useful by the teacher of auto electricity.

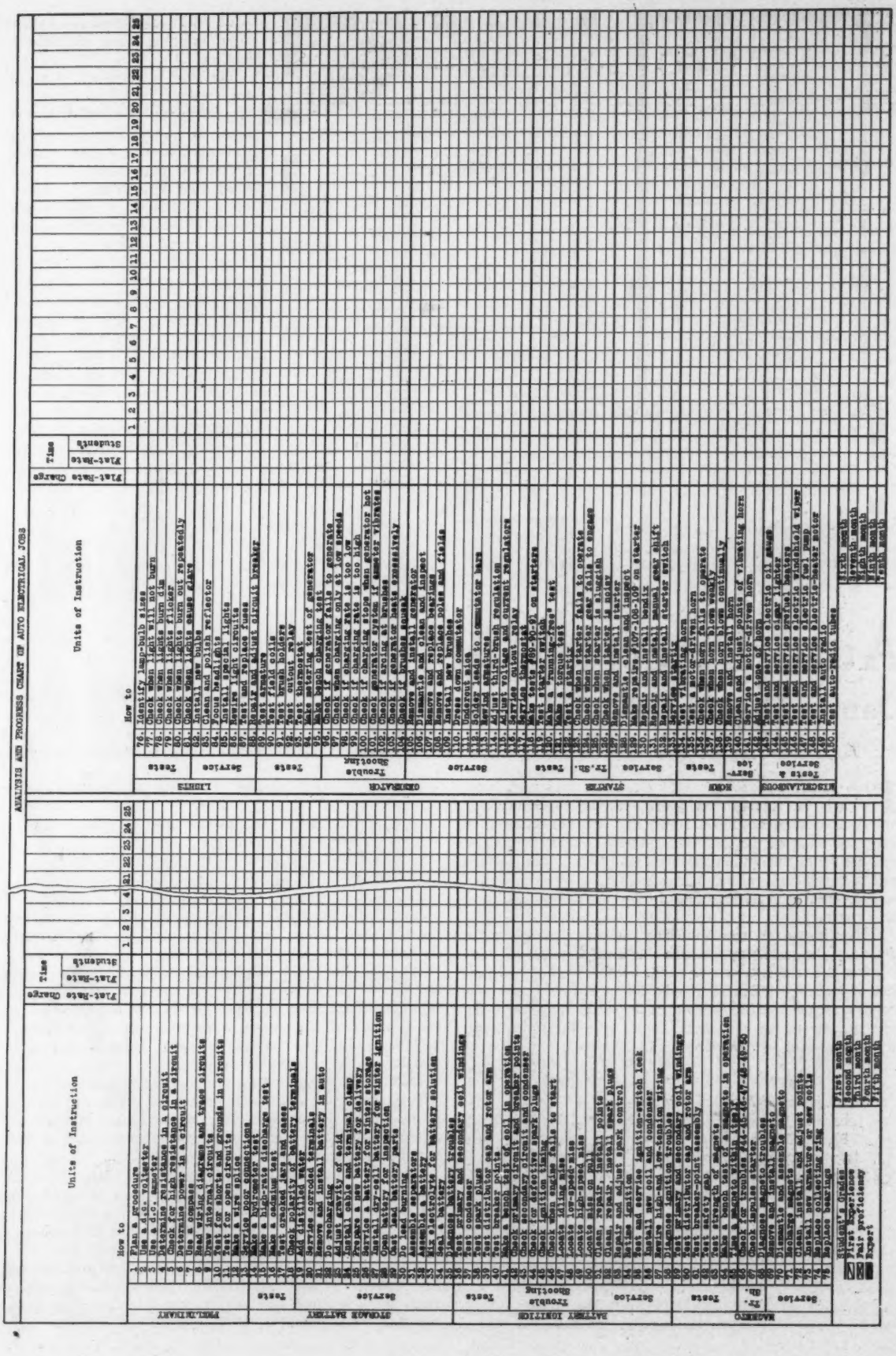
4. *As a vocational-school course.*
   Jobs 1 to 150. Two years to complete the work.
   Jobs should be repeated to gain skill in performance.

The chart provides a space to keep a record of all the jobs completed by the student. The following method is used in the vocational school and could be used to some extent in the other schools. One line drawn diagonally across the rectangle after the job and below the student's name indicates the student has completed the job once. After the student gains some experience by repeating the job, a cross is put in the rectangle. If the student repeats the job enough times to become skillful, the rectangle is shaded in black to indicate that he is good as a regular mechanic.

Each student should have progress sheets covering all the jobs shown on the chart with a space for grades and remarks by instructor. These sheets could be used when applying for a position to show the prospective employer the kind of work that he had accomplished.

There is a space for "flat-rate" time and charge. It is not intended that this information be given for each job, but should be given for the most common jobs. A space is provided for the student's time which will give the student a chance to compare his time with the flat-rate time.

Instruction should be carried on by job sheets and information sheets. The first experience on jobs should be made on parts from wrecked automobiles; but later, after some experience, work should be on cars in service.


ANALYSIS AND PROGRESS CHART OF AUTO ELECTRICAL JOBS
How to
Units of Instruction
Plat-Mate Chart
Plat-Mate
Students
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
LIGHTS
Tests
Service
CRANKING
Trouble Shooting
STARTER
Tr. Sh.
IGNITION
COIL
HORN
Tests & Service
MISCELLANEOUS
1. Plan a procedure
2. Use a dc. voltmeter
3. Use a dc. ammeter
4. Check for continuity in a circuit
5. Check for short-circuit in a circuit
6. Determine power in a circuit
7. Use a compass
8. Read wiring diagrams and trace circuits
9. Draw internal circuits
10. Test for shorts and grounds in circuits
11. Make a wire solder
12. Service poor connections
13. Make a hydrometer test
14. Make a high-rate discharge test
15. Test condition of cells
16. Test for grounds in circuits
17. Add distilled water
18. Service corroded terminals
19. Remove and install battery in auto
20. Test specific gravity of acid
21. Install cables and terminal clamp
22. Prepare a new battery for delivery
23. Service a battery for winter storage
24. Install dry-cell battery for winter ignition
25. Open battery for inspection
26. Do lead battery work
27. Assemble separators
28. Assemble a battery
29. Mix electrolyte for battery solution
30. Seal a battery
31. Diagnose battery troubles
32. Remove and reconnect coil windings
33. Test condenser
34. Test spark plugs
35. Test distributor cap and rotor arm
36. Test breaker points
37. Make a point dwell of coil in operation
38. Check secondary circuit with voltmeter
39. Check for defective spark plugs
40. Check ignition timing
41. Locate misfiring cylinder
42. Locate high-speed miss
43. Locate miss on pull
44. Clean, repair, install points
45. Clean, repair, install spark plugs
46. Repair and adjust spark control
47. Retime ignition
48. Test and service ignition-switch lock
49. Install new coil and condenser
50. Diagnose ignition troubles in engine
51. Diagnose ignition troubles in engine in operation
52. Test primary and secondary coil windings
53. Test distributor cap and rotor arm
54. Test safety gap
55. Test strength of magnets
56. Remove and assemble magneto
57. Make a magneto with timing device in operation
58. Test for troubles with Ark-U-Rite-Ky-To-Ga-Mo
59. Check impulse starter
60. Diagnose magneto troubles
61. Remove and install magneto
62. Remove and assemble magneto
63. Clean, install, and adjust points
64. Install new armature or new coils
65. Replace collecting ring
66. Replace bearings
Students Grades
First Experience
Fair proficiency
Expert
First month
Second month
Third month
Fourth month
Fifth month

Problems and Projects

COLONIAL TABLE

Franklin H. Gottshall, Scotch Plains, New Jersey

(See Supplement 306)

The colonial hanging wall bookshelf shown in connection with the colonial table in the halftone, will appear in a coming issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

The colonial table shown herewith presents a design adapted from early colonial trestle tables. It has turned posts and rails, the turned elements being deeply cut, well formed, and with enough variety to make them interesting. The table is light for its size, but quite sturdy.

Method of Procedure

Select stock slightly more than 3 in. square for the legs and rails. Square the pieces and smooth and dress them to a fine surface. Center them in the lathe and turn them, being careful that the curves are well shaped. Curves, to be beautiful and effective, must connect with the fillets to form right angles and the fillets should be perfectly shaped and clearly

A handsome living-room group in which is shown the table described in this article

cut. Next, lay out all mortises and cut them very carefully. Then lay out the tenons and fit each to its proper mortise to insure snug joints. After the joints have been fitted, shape the feet and the supporting members for the top. The frame then is ready to be glued and assembled after which its joints are to be inspected and dressed down to perfectly flat surfaces.

The top should be glued up and dressed to size in the meantime. The molded edge may be shaped with a gouge and an ordinary chisel, if no better means are available. The top is fastened with wood screws passed through slots in the supporting members as shown in the detail drawing. The slots are used in preference to drilled holes to allow for expansion and contraction.

Finish with a coat of oil stain, followed by an application of filler. Allow this to dry, when rubbed off, for 24 hours; then apply a thin wash coat of shellac. This should be steel-wooled lightly after 24 hours of drying, and followed by two coats of a good grade of 4-hour varnish. The final coat of varnish should be rubbed down with pumice stone and oil. After several days have elapsed this may be followed by an application of wax.

CRICKET STOOL

Howard V. Patterson, Shawnee-Mission Rural High School, Merriam, Kansas

(See Supplement 307)

The student who desires a turning project, which requires some skill in the fitting of parts, and considerable beauty of line, may enjoy making a cricket stool. The small size of the project may also make it attractive, especially at the present time when money for materials is not plentiful.

In the selection of a wood for this stool, maple and birch will prove most attractive. When finished in oil and wax, their natural color lends a pleasing contrast in a room filled with the usual array of dark furniture. In case the light effect is not desired, black walnut may be used.

Special care must be taken in boring the holes to receive the rungs and legs. A bevel gauge stood upon the stock will direct the angle at which to hold the brace and bit during this process. Strength is gained by having the legs extend entirely through the top, and wedging them in place. This feature adds to the rustic appearance of the design. The figure shows an elliptical top, but some students will enjoy drawing a pattern with an edge outline that is more ornate.

A SENSITIVE GALVANOMETER

H. Trelease, Bloomfield, New Jersey

The galvanometer is an instrument for detecting or indicating the presence of an electric current by means of the deflection of a magnetic needle round which the current is caused to flow through a coil of wire.

It very often happens that the electrician has to measure very small quantities of current, with a high degree of accuracy. Indicating instruments are then of very little service to him, and he has to make use of much more sensitive instruments. The principal measurements to be made are measurements of: (*a*) resistance, (*b*) electromotive force, (*c*) magnetic quantities, and (*d*) capacity; and in these cases a sensitive galvanometer is employed.

For ordinary work in the school laboratory, such as detecting currents when making apparatus, testing field coils, insulation tests for armatures, etc., a simple horizontal pattern with pivoted needle and scale divided into degrees will suffice. The detector galvanometer shows the presence or absence of an electric current, and not the strength or pressure of the current. It is also used to show the direction in which the current is flowing.

The instrument herein described consists of a hardwood frame with aluminum sides or plates. The coil is made of No. 30 copper wire d.c.c. In the center of the hardwood frame is pivoted a magnetic needle. This needle carries a light pointer at right angles to it which appears through the central

aperture, and shows the slightest movement of the magnetic needle upon the scale.

To construct the galvanometer:

1. Take a piece of No. 20 gauge sheet aluminum. Cut out two pieces 3½ by 3½ in. Square the edges and round off the corners.

2. From the center of the plates, cut 1½ by ½-in. slots. This may be done with a coping saw, after which the edges of the slots are to be finished with a smooth file.

3. Select a piece of hard wood for the frame, and make this according to the dimensions given in Figure 2. Exercise care when making the slot, which must be true and square.

4. Place the aluminum plates in position, and mark and drill them for No. 5 by ½-in. r.h. brass screws. Drill two holes in one of the plates to take the terminals.

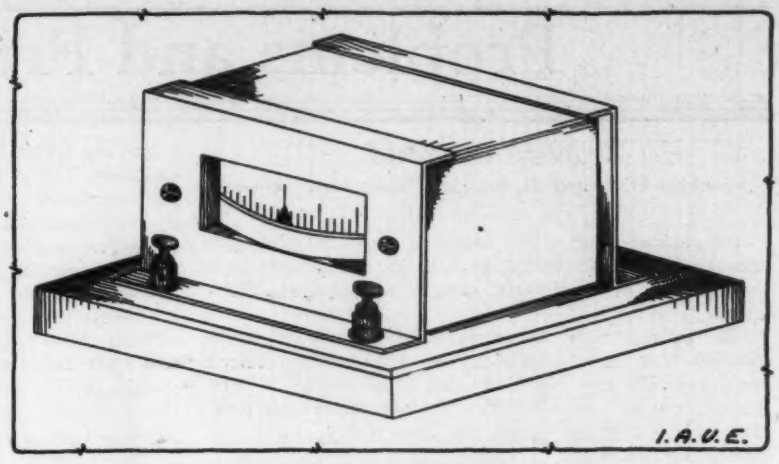


Fig. 1. Sensitive Galvanometer

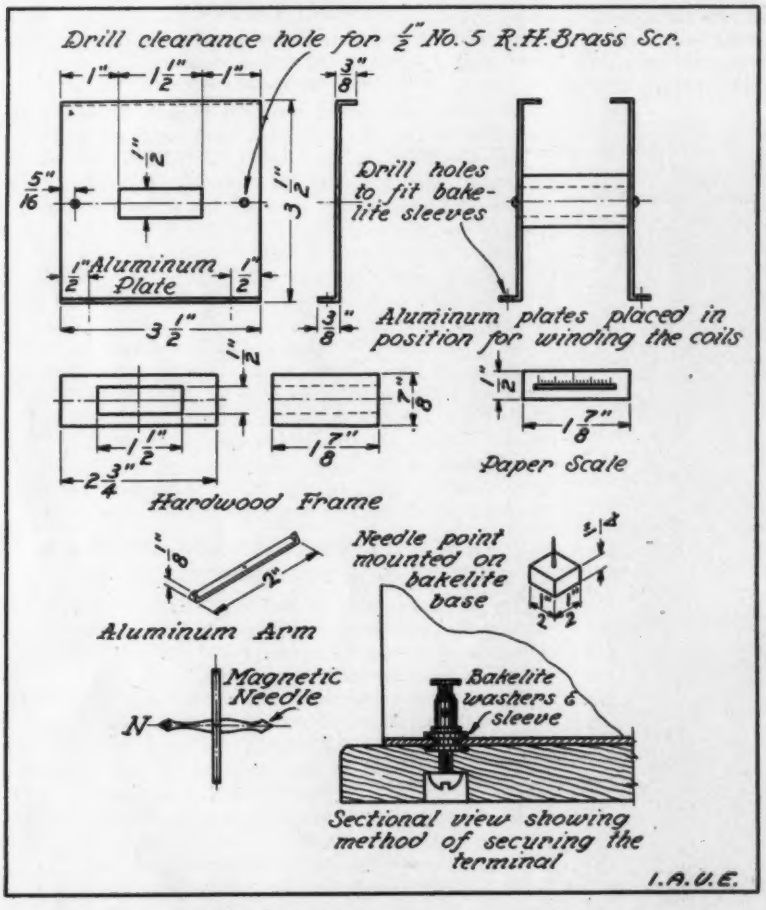

Drill clearance hole for ½" No. 5 R.H. Brass Scr.
Drill holes to fit bakelite sleeves
Aluminum plates placed in position for winding the coils
Paper Scale
Hardwood Frame
Aluminum Arm
Needle point mounted on bakelite base
Magnetic Needle
Bakelite washers & sleeve
Sectional view showing method of securing the terminal
I.A.U.E.

Fig. 2. Details of sensitive galvanometer

5. The baseboard is made of ¾ by 4½ by 4¾-in. white wood.

6. Attach the aluminum plates to the hardwood frame. Cover the inside of the plates with thin silk or paper. Wind as evenly as possible, either by hand or between lathe centers, 1000 turns of No. 30 d.c.c. copper wire. Avoid kinks and breaks in the wire. Remove the insulation from the ends and secure them under the heads of the terminal screws.

7. Test the winding for leakage and continuity.

8. Cover the coil with a piece of black cloth. This greatly improves its appearance.

9. Secure a magnetic needle approximately 1⅜ in. long (this had better be bought). Cut a light aluminum arm, bend each end at right angles as shown in Figure 2, and place the arm at right angles to the magnetic needle. Take care that the two balance evenly.

10. Make a bakelite or hard-rubber base ½ by ½ by ¼ in. thick. Break off a needle point about ½ in. long, and push it through the center of the base. Be sure it stands centrally and upright. Glue the base in the center of the hardwood frame, taking care to keep all glue and dirt off the needle point.

11. Cut 2 pieces of heavy white paper, 1⅜ by ½ in., and rule off the graduations 1/16 in. apart. This is the scale which must be placed securely in the aperture of the plates.

12. Avoid short circuits. Use bakelite or hard-rubber washers and sleeves when securing the terminals to the baseboard.

This instrument presents no great difficulties in construction, and will be found to be really very sensitive and of much general utility. It is fairly robust, and, having a double scale, can be seen by several experimenters when working together.

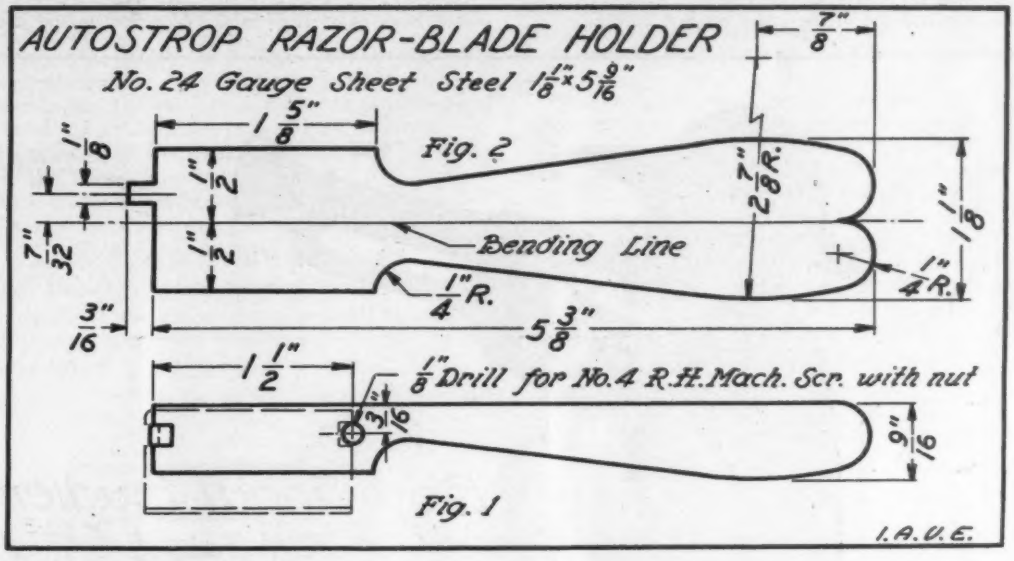
AUTOSTROP RAZOR-BLADE HOLDER

C. H. Niemann, Hammond, Indiana

The razor-blade holder illustrated and described herewith makes an ideal stencil cutter. To make this holder, proceed as follows:

1. Lay out the handle shown in Figure 1, on a piece of heavy paper which is folded once.

2. Cut out the form accurately.
3. Unfold the paper and it will look like Figure 2.
4. Using this as a template, lay out the pattern on a piece of sheet metal. The small ⅛ by 3/16-in. projection when bent over forms a catch for the notch in one end of the blade.
5. Drill a hole for a No. 4 r.h. machine screw to fit into the notch at the other end of the blade. For inserting or removing the blade, take out the screw.
6. Finish the handle with two coats of any desired enamel.



A TIE RACK

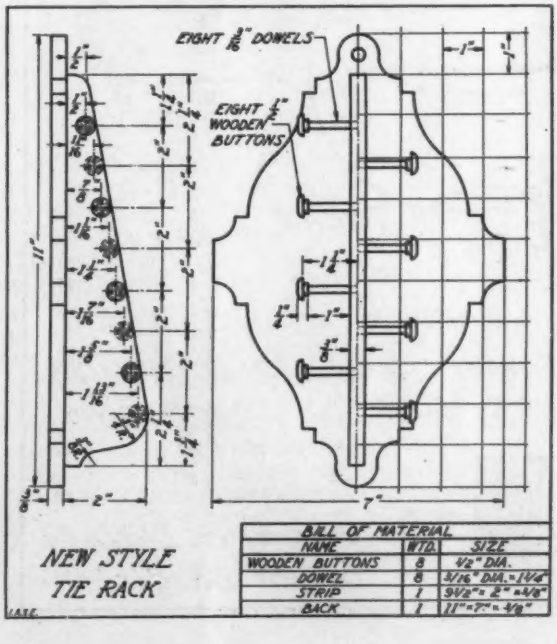
I. M. Fenn, Von Steuben Junior High School, Chicago, Illinois

This tie rack appeals to the pupil for the reason that it is different from those usually seen in the woodworking shops. It is designed to hold eight ties.

The first step in making this project is to make a drawing or pattern of one half of the tie rack. This half pattern is then traced on the wood, turned over and the other half traced. The student is encouraged to design his own pattern, but he must conform to over-all dimensions. The wooden buttons and holes in the rib are then drilled for the dowels. The buttons and dowels are held in place with glue and the rib is fastened to the back with nails or screws.

A hole is drilled in the back close to the top of the tie rack for the purpose of fastening it to the wall.

The project can be finished according to the taste of the pupil, with stain or with lacquer.


EIGHT 3/16" DOWELS
EIGHT ½" WOODEN BUTTONS
NEW STYLE TIE RACK
BILL OF MATERIAL
NAME | NO. | SIZE
WOODEN BUTTONS | 8 | ½" DIA.
DOWEL | 8 | 3/16" DIA. - 1¼"
STRIP | 1 | 9½" - 2" - ⅛"
BACK | 1 | 11" - 7" - ⅛"

PEWTER SILHOUETTE PAPERWEIGHT

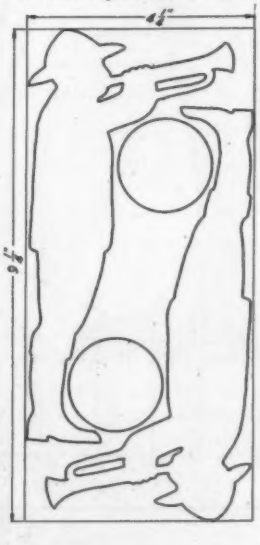
E. W. Manzer, Bronxville, New York

The silhouette cut-out of the boy scout bugler will prove to be a good project for scouts. They will enjoy making it for themselves or for their scoutmaster. When completed, it makes a very attractive piece for the fireplace mantel or the piano.

To make this project economically, it will be best to cut out stock so that two buglers can be cut from one piece. This will enable you to get the circle for the base from the same piece used for the silhouette.

The following instructions for making the project have been tried out and found satisfactory:

1. Cut 1 piece of 14 B & S gauge pewter, 4¼ by 9¼ in. This will make two silhouettes and two base circles.



2. Rub surface with fine old emery cloth to remove the bright surface of the metal.
3. Trace figures on heavy paper so that when it is cut out it will make a suitable pattern which will enable you to trace around it with ease.
4. Trace around the pattern using a sharp pencil or a sharp metal point such as a scriber.
5. Cut out the figure with a jewelers' saw or with a power jig saw. Be sure to cut on the outside of the lines so that there is a little room for filing the edges.
6. Drill small holes near

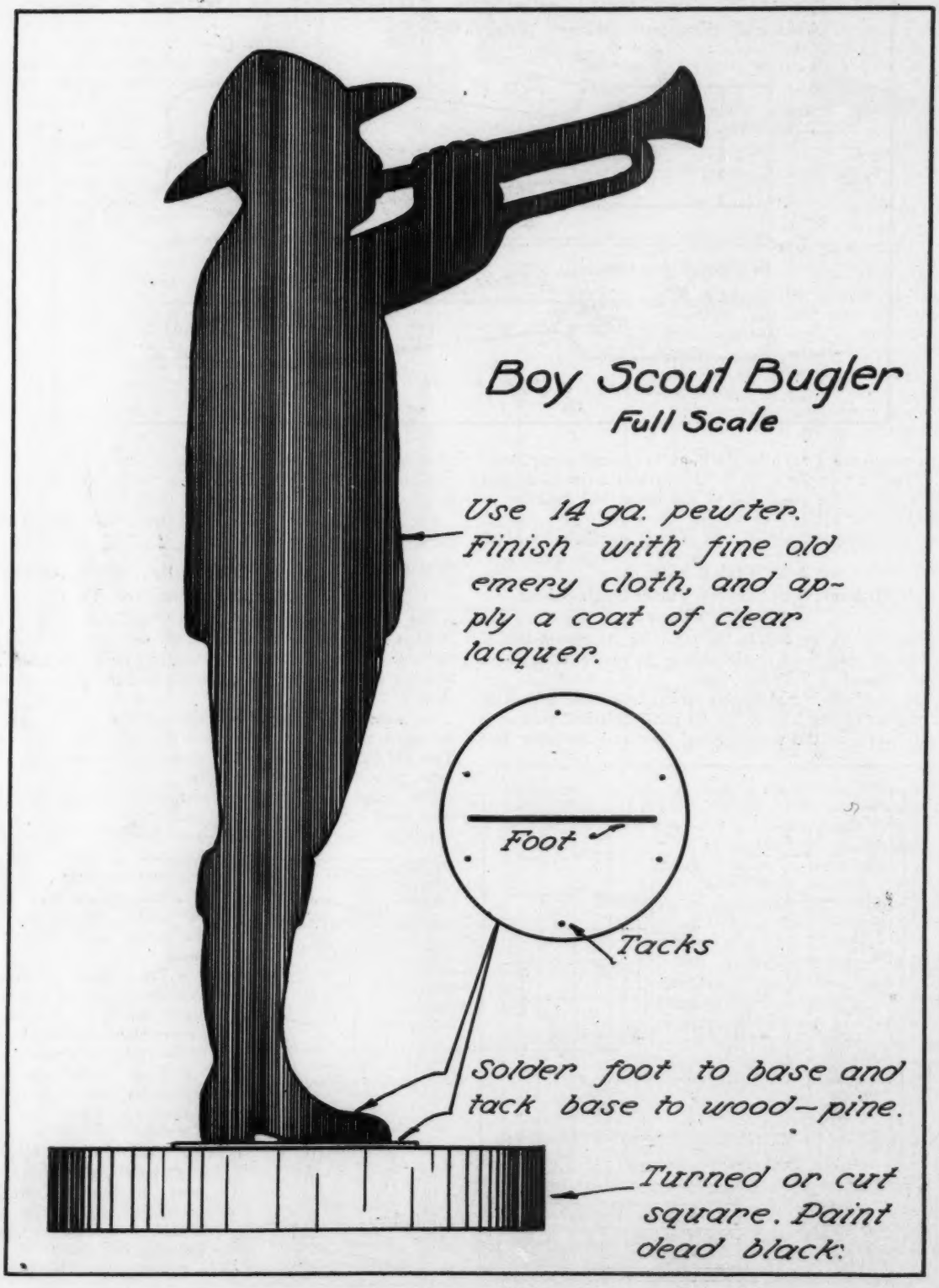
the mouth and inside of the lower part of the bugle. Insert the saw blade in this hole and then proceed to cut out the metal.

7. Finish all edges with a fine file and then use old emery cloth. The emery must be fine grit else it will scratch the metal too deeply. Some of the edges may be buffed.

8. Cut out the circle for the base. Locate and drill holes for fastening the base to the wood block.

9. Use fine emery cloth and rub the bugler in one direction so that the lines will form a satin finish.

10. Solder the bugler to the metal base. Use low melting solder. Blow flame from mouth blowpipe on the joint until


Boy Scout Bugler
Full Scale
Use 14 ga. pewter. Finish with fine old emery cloth, and apply a coat of clear lacquer.
Foot
Tacks
Solder foot to base and tack base to wood—pine.
Turned or cut square. Paint dead black.

Pewter silhouette paperweight

the solder melts. Use rosin, commercial flux, or pewter flux for the job.

11. Wash off all flux, clean metal wherever it has become dirty, and be sure that the hands do not come in contact with the metal. Use cloth gloves. As soon as the metal is all clean, spray or paint on clear duco lacquer or silver lacquer. Stand and let dry.

12. Turn the wood base for the figure. The drawing shows a plain round base but other designs may be developed for the base. Molding edges of various kinds will enrich the base and thus add to the final appearance of the project.

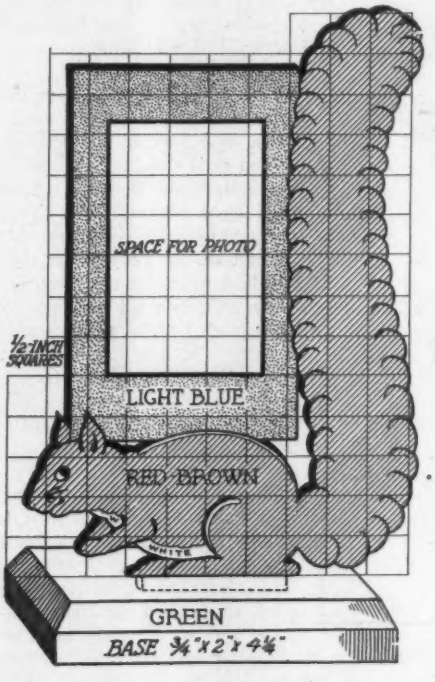
13. Stain and finish the wood base. Do a good job of finishing. If desired, the base may be painted a dead black.

14. Tack the bugler to the wood base using short escutcheon nails.

ANIMAL PICTURE FRAMES

W. Ben Hunt, Hales Corners, Wisconsin

The uprights of the frames shown herewith are made of 3/16-in. plywood. The bases may be made of pine or any other scrap lumber.



The finish used on these projects consists of a coat of shellac to act as sealer, after which the enamel is applied as indicated. Black may be used for outlining and shading where no color is indicated.

The space for the photograph or picture should be left bare to give the glue or paste a better grip.

A NEW TRACING MEDIUM

Jos. J. Lukowitz, Milwaukee, Wisconsin

Ordinary photographic film from which the emulsion has been removed makes an excellent tracing medium for making tracings from halftones or photographs. Tracing paper or tracing cloth is not transparent enough for such work.

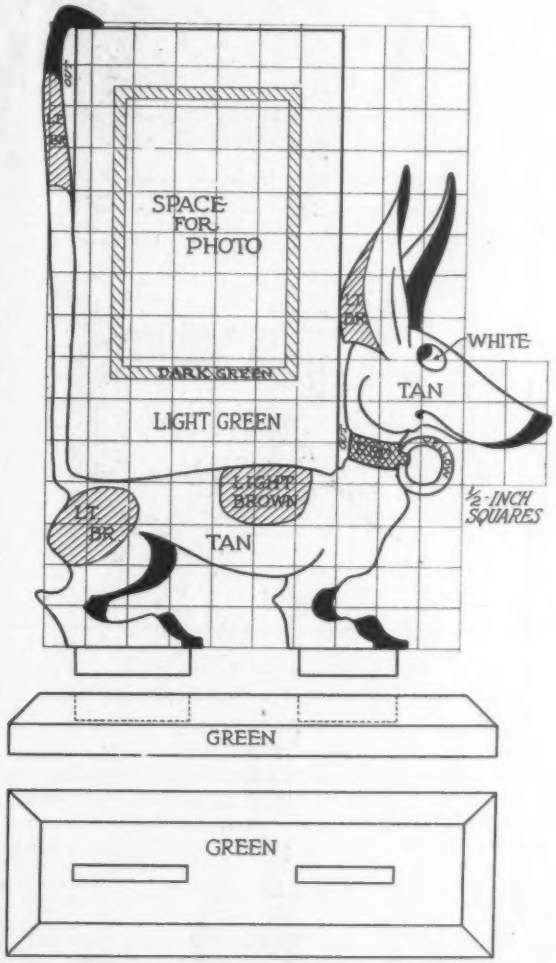
Discarded or spoiled negatives may be procured from any photographer. Eight- by ten-inch film is convenient for most work and is a little thicker than the smaller sizes. Loosen the emulsion on the film by soaking the film in warm water for two or three hours. After soaking, scrape lightly with the edge of a piece of wood and then rub with a coarse rag to remove the emulsion. Do not scratch the film with a knife. Both sides of the film should be cleaned.

When the film is thoroughly dry, one side should be slightly roughened with No. 1 steel wool to give it sufficient tooth to hold the ink. It is best to do the tracing with india ink, although a very soft pencil may be used.

To transfer a tracing from the film to paper, proceed as follows:

Place the paper over the film and hold over a sheet of glass with an electric light beneath or hold against a window in daylight if an electric light is not convenient. The object being traced will stand out remarkably well and may readily be traced onto the paper. When the tracing is finished the ink may be washed from the film with cold water. Thus the same film may be used again and again.

Blueprints could be made directly from the film but avoid exposing the film to an arc light as the film is highly inflammable. The working surface of the film should be rubbed with talcum powder or chalk dust from time to time to remove the oil which is deposited by the hands.



A UNIQUE FOOTSTOOL

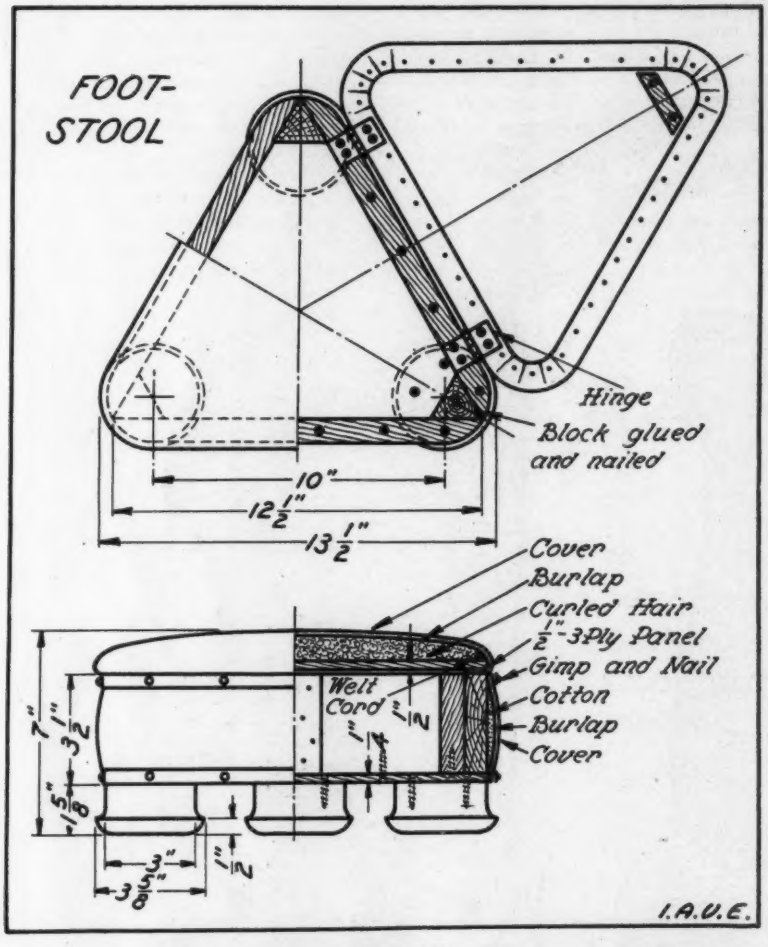
John Rohner, Johnston City, Illinois

The frame of the footstool described herewith may be constructed as shown. The corner blocks are glued and nailed into position after which the corners are rounded off. The legs may be turned on the lathe out of 2 by 4-in. stock cut

3⅝ in. long. The legs should be nailed and glued to the ¾-in. 3-ply bottom before the latter is nailed to the frame. If desired a frame with webbing may be substituted for the cover panel.

The design may be executed in square, round, or polygonal shape.

The legs are practical because they slide easily over the rugs.

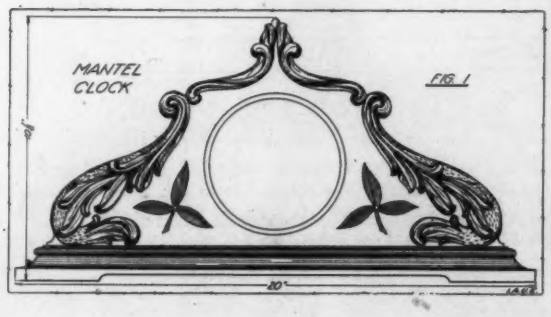


A CARVED CLOCK CASE

**Paul C. Nelson, The Stout Institute,
Menomonie, Wisconsin**

Experiences are gained in several phases of fine cabinetmaking and ornamental woodwork in the construction of this project. It involves spline mitering, heavy scroll sawing, smoothing of large intricate curves, plywood construction, veneering, inlaying, molding, and carving. The proper execution of the work will tax the abilities of advanced students in cabinetmaking in senior high schools and vocational schools.

Most of the dark, hard cabinet woods are suitable for this project. The clock case in Figure 1 was built of American walnut. The face veneer is selected butt walnut, and the leaf inlays and upper base member are dark mahogany. The stem inlays are ebony. Probably an even more pleasing appearance would be obtained by using rosewood for the leaf inlays and walnut for both base members. The case illustrated measures 20 inches along the base and 10⅛ in. total height. The clock face is approximately 5½ in. in diameter. The same design and proportions would probably look well reduced to three fourths or two thirds of these dimensions.



Construction

Main Frame

Square up two side pieces, Figures 2 and 3, to 2 by 4½ in. Rough length is 13½ in. Square up the bottom board to ½ by 4 in. Cut it to 15½ in. finished length; drill and countersink as indicated in Figure 2.

Rabbet the side pieces for the front panel and for the hinged back lid as shown in Figure 3. Cut the miters at the top ends and the bevels at the bottom ends, Figure 2. These cuts are best made on a tilt-table circular saw. On the same machine make the rabbets for the bottom, the grooves for the spline, and the notches for clamping. Make the spline with its grain running across the miter joint. Carefully fit the miter joint and size it with a very thin glue. When the size has dried, apply strong glue to the miter surfaces and the spline, and clamp the joint. Fasten the bottom with glue and screws.

Plywood Panel

From soft wood cut a triangular core ¼ in. thick, vertically grained, and two face plies each ⅛ in. thick, horizontally grained. These pieces should be at least ½ in. oversize on each of the three sides. Glue them together in a veneer or by the use of heavy cauls and hand screws. When dry, fit the panel into the front rabbets of the main frame; glue and clamp in place. If desired, a 5-ply panel may be built up as shown in Figure 3.

Veneering the Face

The joint between the plywood panel and the main frame may in time produce a visible line through a thin face veneer. This can be overcome by crossbanding. The crossband may be a plain veneer, vertically grained, and the face a selected butt or crotch veneer with horizontal grain. Plane the assembled frame and plywood panel to a straight and smooth surface, and glue the veneers in place using a heavy, heated caul and hand screws. Spread glue on only the main body part and on both sides of the crossbanding. If glue is spread on the back of the face veneer, the excessive expansion and later shrinkage in this veneer causes great enlargement of the surface pores and often results in innumerable hair cracks.

Cutting the Curves

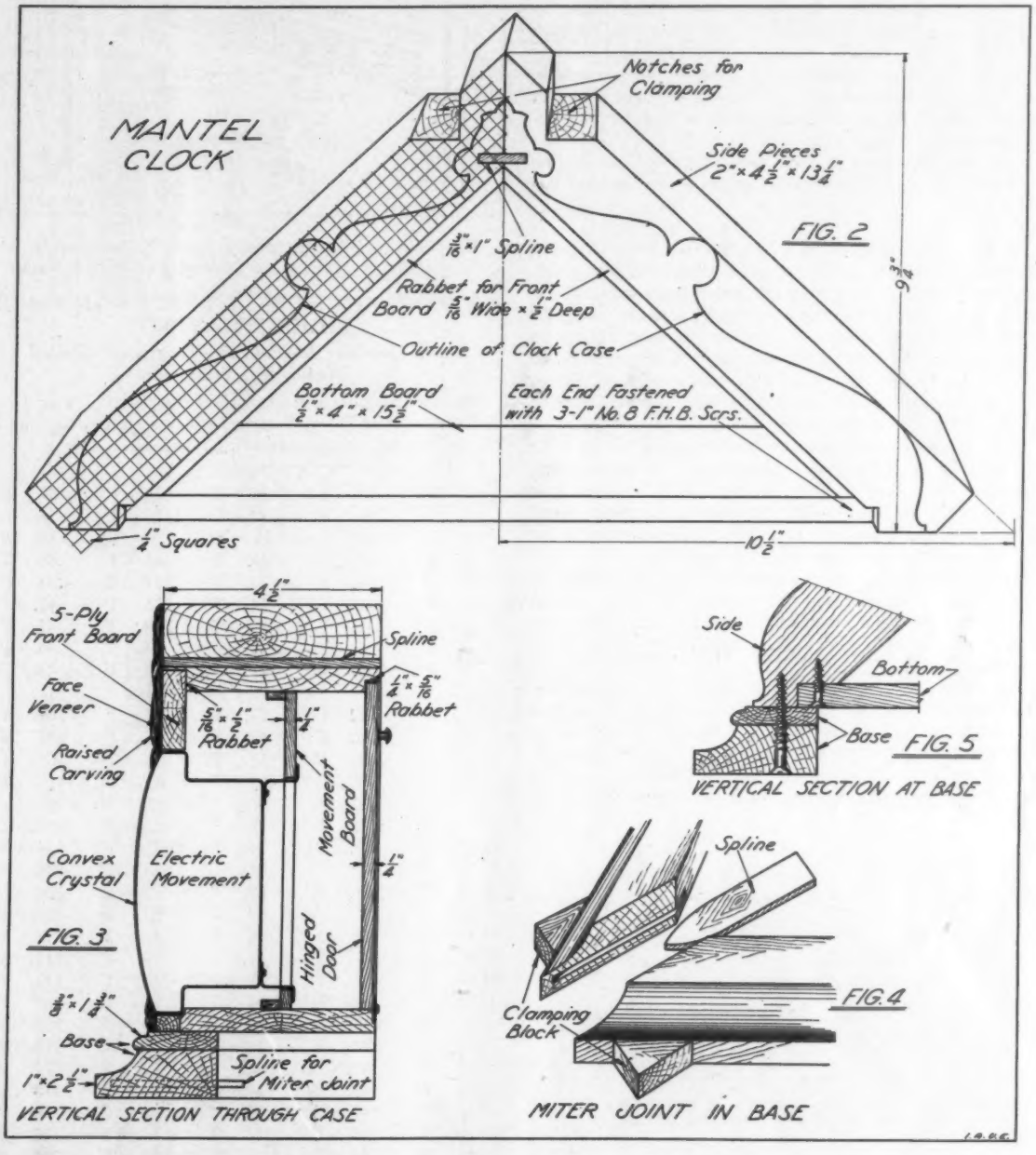
Make a full-sized pattern for one side of the clock case. See Figure 2. Mark off and band-saw the case sides, cutting right to the line. A sharp ¼-in. band saw will cut these curves without undue difficulties, but the saw guides must be properly fitted and the table set perfectly square to the cut of the blade.

Inlaying

Cut ½-in. strips of veneer diagonally across the grain for the leaf inlays. Joint the strips in pairs and tape them together so that the grain runs at right angles at the joint. Make cardboard patterns for each leaf and mark of the leaf

The Scrolls

Make two cardboard patterns, one for the upper and one for the lower curved scrolls, similar to those shown in Figure 1. These patterns must correspond with the larger pattern made for band-sawing. Lay out and saw the scrolls from



inlays. Undercut the edges of the inlays toward the back side. Place the inlays in position on the veneered surface and score their outlines. Cut the scored outlines through the veneer and remove the surplus.

Apply glue to the recess and to face and back sides of the inlay. Use a veneer hammer for rubbing the inlays down until complete adherence is obtained. A tinner's cross-peen hammer will do the job also. If the glue sets too early, reheat it by applying a hot flatiron or a heated block of wood for a few seconds.

After the inlays and glue have dried, carefully smooth and sand the entire face surface.

stock at least ½ in. thick. Resaw them to final thickness of 3/16 in. Plane the back side of each scroll and glue them in place on the face of the case.

Smoothing the Curves

Plane the larger curves with straight- and round-bottomed spokeshaves. Smooth the smaller curves with chisels and gouges and with half-round and round cabinet files. With medium sandpaper wrapped on rounded sanding blocks, smooth the curves to final shape and uniform surface. Finish all curves with very fine sandpaper, sanding with the grain of the wood.

Carving

Lay out the main lines of the carvings on the scroll patterns and cut out to the width of a pencil point. Sufficient cross ties must be left in the cuts to hold the pattern parts together. Place the patterns on the scrolls and mark the carving lines with a pencil.

A fairly good selection of carving tools — from eight to twelve tools — should be available. The kit should include a medium and a narrow V-tool, a medium and a narrow skew, and two sets of gouges from ⅛ in. to ⅝ in. in width. One set should be deep and the other of medium depth. A beginner should do one or more complete trial carvings before attempting these scrolls.

A carving tool must be kept very sharp and the cutting edges must lie in a plane at right angles to the body of the tool.

Bases

Square up the stock for each base member in one continuous piece. Mold each piece on a spindle shaper or with molding planes. Miter and groove the lower base member and make the splines as indicated in Figure 4. Glue triangular clamping blocks in place, and after several hours, glue and clamp the miter joints. Miter the upper base member and fasten it to the lower member with glue and brads. Fasten the assembled base to the main body with screws, Figure 5.

Mounting the Clock Movement

If the design of the clock rim permits, mark the hole for the movement with a pair of dividers about 1/64 in. too large, and score fairly deep with the dividers. With a coping saw, cut just to the inside of the line. Marking and cutting according to these instructions will eliminate the tendency to loosen the veneer on the back stroke of the sawing.

Figure 3 indicates how one type of movement housing is held in place by an inserted center partition. Other types of housing may require different mountings, and the hinged door in back may in some cases be eliminated.

Finishing

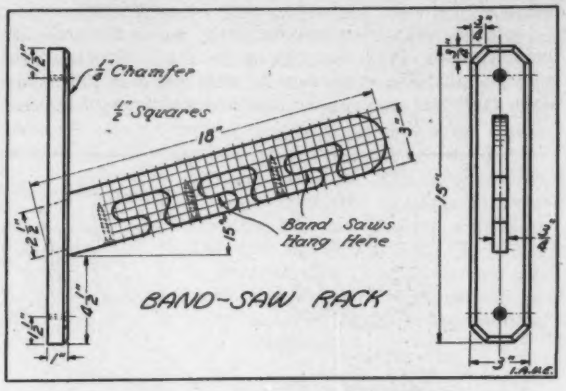
The case shown below was finished by applying several coats of boiled linseed oil daily for two or three days. Before the oil had a chance to set, all surface oil was removed with fine steel wool and sandpaper. A very light film of oil was thoroughly rubbed into the surfaces daily for several days to give a final satiny finish of great depth and durability.

The finished clock

BAND-SAW RACK

Louis F. Barocci, High School, Cudahy, Wisconsin

This band-saw rack is patterned somewhat after one seen in the woodshop at the Stout Institute, Menomonie, Wisconsin. Never having noticed one in print in any industrial-arts magazine, the writer thinks that some teachers would be glad to have access to a drawing of a device that is handy and so easily constructed. Birch or maple is very suitable for this project.



Band-saw rack submitted by Louis F. Barocci, High School, Cudahy, Wis. Made preferably of birch or maple

SCORING SHEET FOR TESTS FOR HAND FIBER WEAVING

Emil Gandre, Sheboygan Vocational School, Sheboygan, Wisconsin

The following is a scoring sheet for parts I and II of "Tests for Hand Fiber Weaving" which appeared on page 17 of the January, 1935, issue of this magazine.

Part I

1. T	10. T	19. T	28. F	37. T
2. T	11. T	20. F	29. T	38. F
3. F	12. F	21. T	30. T	39. T
4. T	13. T	22. T	31. T	40. T
5. F	14. T	23. T	32. T	41. F
6. F	15. T	24. T	33. T	42. T
7. F	16. T	25. T	34. T	43. F
8. T	17. F	26. T	35. F	44. T
9. F	18. T	27. F	36. T	45. F

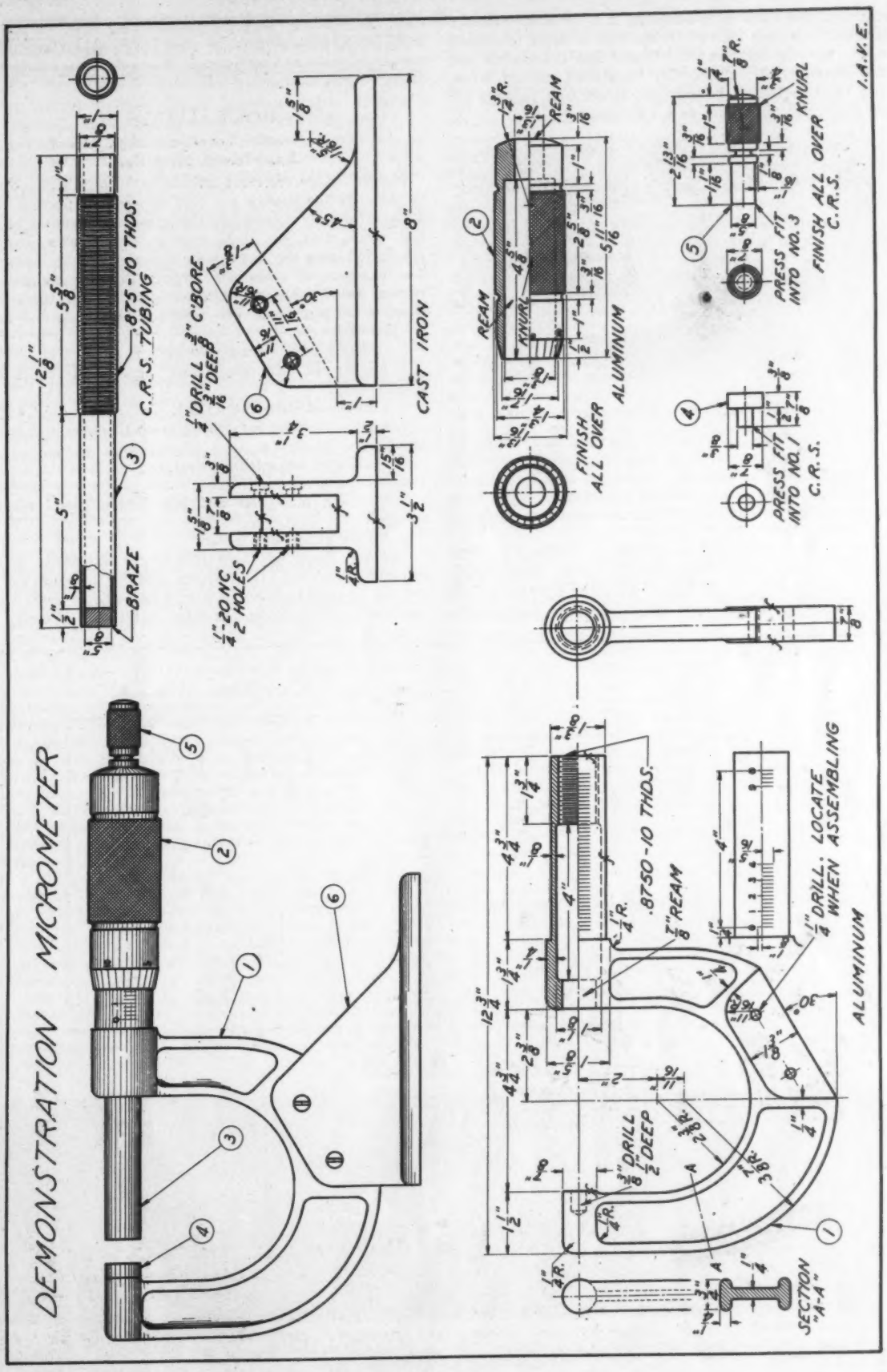
Part II

1. T	26. T	51. T	76. T	101. T
2. F	27. T	52. T	77. T	102. T
3. T	28. T	53. F	78. T	103. T
4. T	29. T	54. T	79. T	104. T
5. T	30. T	55. T	80. T	105. T
6. F	31. F	56. T	81. F	106. T
7. T	32. T	57. T	82. T	107. F
8. T	33. T	58. T	83. T	108. F
9. T	34. T	59. T	84. T	109. F
10. T	35. T	60. F	85. T	110. F
11. F	36. T	61. F	86. F	111. T
12. T	37. T	62. T	87. F	112. T
13. T	38. T	63. F	88. T	113. F
14. T	39. F	64. T	89. T	114. F
15. T	40. F	65. T	90. F	115. F
16. T	41. F	66. T	91. T	116. T
17. F	42. F	67. T	92. F	117. F
18. F	43. T	68. T	93. T	118. T
19. T	44. T	69. T	94. T	119. T
20. T	45. T	70. T	95. T	120. T
21. T	46. T	71. T	96. T	121. T
22. T	47. T	72. T	97. F	122. T
23. F	48. T	73. T	98. T	123. T
24. T	49. T	74. F	99. T	124. T
25. F	50. T	75. T	100. T	125. T

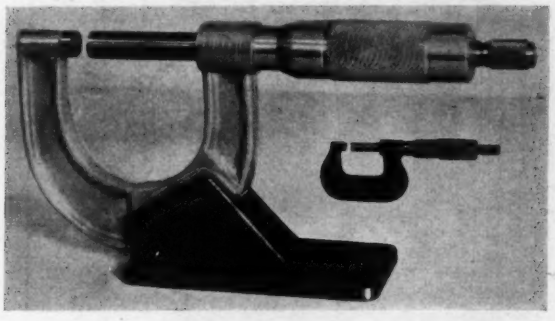
DEMONSTRATION MICROMETER

W. L. Nasht, J. Sterling Morton High School, Cicero, Illinois

Very simple in construction, this oversized micrometer proves to be very efficient in teaching a group of students how to read the micrometer. A regular 1-inch micrometer is not always available to the class interested in its use and


DEMONSTRATION MICROMETER
I.A.V.E.
C.R.S. TUBING
.875 - 10 THDS.
BRAZE
CAST IRON
DRILL
C'BORE
DEEP
1/4"-20 NC
2 HOLES
REAM
KNURL
FINISH ALL OVER
ALUMINUM
PRESS FIT INTO NO. 3
FINISH ALL OVER
C.R.S.
PRESS FIT INTO NO. 1
C.R.S.
.8750 - 10 THDS.
.8750" REAM
DRILL, LOCATE WHEN ASSEMBLING
ALUMINUM
DRILL DEEP
SECTION "A-A"

principles, and when it is available, it is so small that the instructor must use blackboard sketches in order to explain crudely how the inch may be divided into thousandths and ten-thousandths. Then, too, this blackboard method leaves much to the student's imagination, unless it is possible for him eventually to practice on a micrometer.



Demonstration Micrometer

The demonstration micrometer described and illustrated herewith is large enough to be seen from a reasonable distance, due to the fact that the graduation lines on both the thimble and the frame are about ⅛ in. apart and ⅜ in. long. It is ruggedly constructed so that regular classroom manipulation will not harm it.

The frame and thimble are aluminum castings and the screw is tubular with a hardened-steel anvil, corresponding to the one mounted in the frame. While the material cost is small, it makes an excellent project for the mathematics room, the drafting room, the woodworking shop, the general metal shop, and the machine shop. A group of test blocks may be prepared and used just as the regular 1-in. micrometer might be used on standard test blocks.

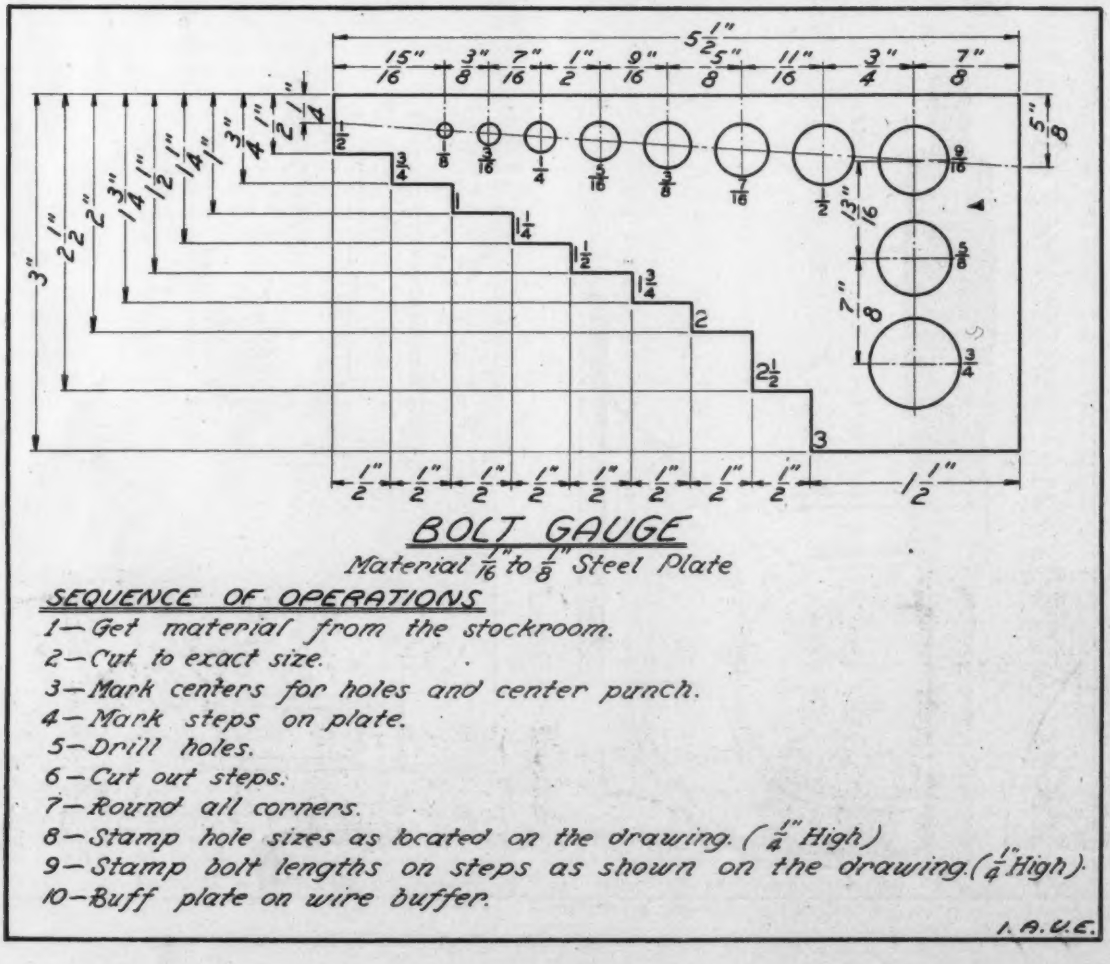
BOLT GAUGE

Frank Svuger, Vocational High School, Long Island, New York

The bolt gauge described and illustrated in this article can be made by the student not only to serve its purpose as a means of quickly determining the length and diameter of the bolt, screw, rivet, etc., to be ordered, but also as a practical job in following the instructions indicated on the blueprint. The sequence of operations involves the interpretation of written instructions, and indicates, step by step, the operations to be performed. The following operations and tools are involved:

1. Ordering stock (writing out order).
2. Laying out drill centers and steps (steel scriber and straightedge).
3. Cutting out steps (hack saw).
4. Center-punching for drilling holes (hammer and center punch).
5. Drilling of holes (drill press).
6. Rounding corners (file).
7. Stamping hole sizes and bolt lengths (steel number stamps).
8. Buffing plate (wire buffer).

The bolt gauge has been found very serviceable in the auto-mechanics shop. The material used for the gauge can be cut out of an old chassis or it may be made of boiler steel. The students include the bolt gauge in their set of tools.


BOLT GAUGE
Material 1/16" to 1/8" Steel Plate
SEQUENCE OF OPERATIONS
1—Get material from the stockroom.
2—Cut to exact size.
3—Mark centers for holes and center punch.
4—Mark steps on plate.
5—Drill holes.
6—Cut out steps.
7—Round all corners.
8—Stamp hole sizes as located on the drawing. (1/4" High)
9—Stamp bolt lengths on steps as shown on the drawing. (1/4" High).
10—Buff plate on wire buffer.
I.A.V.E.

Associations, Conventions

AMERICAN VOCATIONAL ASSOCIATION HOLDS NINTH ANNUAL MEETING IN PITTSBURGH

Approximately 2,000 teachers, supervisors, and directors of industrial arts and vocational education, attended the ninth annual meeting of the American Vocational Association, held December 5 to 8, in Pittsburgh, Pa.

While only two general sessions were scheduled, there were numerous sectional meetings on agriculture, home economics, trades and industries, industrial arts, vocational guidance, and part-time education. The banquet program on Thursday evening attracted 900 persons.

Dr. Walter D. Cocking, State Superintendent of Public Instruction for Tennessee, the principal speaker on the opening program, after tracing the effects of the depression in the trades and industries, stressed the importance of vocational training to the industrial worker, the farmer, and the homemaker. He pointed out the importance of vocational training under the NRA and other governmental agencies, and special emphasis was placed upon its value to the youth of the country.

Greetings from the city were extended to the visitors by Dr. Ben G. Graham, superintendent of the Pittsburgh schools, and State Supt. James N. Rule, of Harrisburg, spoke. Dr. Ray Fife, State Supervisor of Agricultural Education at Columbus, presided.

At the banquet on Thursday evening, Rev. B. C. Clausen, of Pittsburgh, delivered an inspirational talk, in which he emphasized that there can be no vacation for vocational training. He said that the chief vocation of the men of tomorrow will be the vocation of citizenship, and vocational teachers must lead in encouraging and spreading the new social order.

Philip Murray, second vice-president of the American Federation of Labor, in his talk, maintained that "vocational education must be encouraged because it enables students to equip themselves better for the work they intend to pursue after the completion of their school course." He said that vocational education gives the boy or girl a greater appreciation of his value as a citizen to the community, the state, and the nation. In concluding, Mr. Murray indicated that more federal aid will eventually be appropriated for promoting vocational programs, particularly extension courses for adults, and he maintained the trade-union movement will continue its interest in the development of vocational education, and in promoting the well-being of the teacher.

Mrs. J. K. Pettengill, first vice-president of the National Congress of Parents and Teachers, in her talk, stressed the need for the home and school working together on problems of vocational education.

W. F. Patterson, representing the Federal Committee on Apprenticeship Training, in his talk, gave considerable emphasis to apprenticeship training and the future craftsman. He was strong in praise of the attitude of the convention in giving such a prominent part of its program to the apprenticeship-training plan and pointed out that most of the principles incorporated in the program are designed to provide a new form of apprenticeship which will prevent the abuses that have occurred in the past. This program proposes to attach social significance to the early work experiences of young men and women in employment. He contended that a better occupational distribution of workers would result if the training were offered in a wide variety of industrial fields rather than in confining the training to five or six of the more prominent trades.

Dr. Paul L. Cressman, formerly a member of the vocational division of the Pennsylvania State Education Department and now connected with the state department at Lansing, Mich., directed the attention of the convention to his proposal for a national craftsmanship program. The program so impressed the group as to warrant the formation of a national committee to study the procedures.

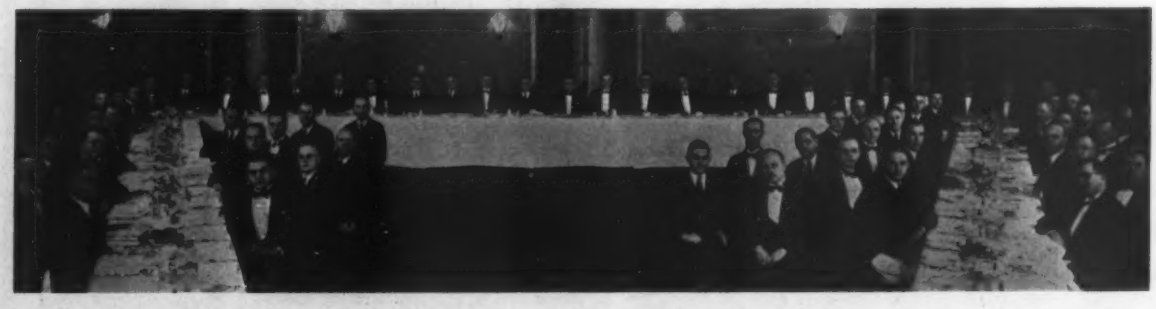
The industrial-education sections were stirred by the address of Dr. Samuel Fausold, Monessen, Pa., on "New Developments Demanded in the Full-time Secondary-school Curriculum," and one by Mr. H. R. Vanderslice, Aliquippa, Pa., on "The Emphasis Upon Co-operation between School and Industry." Dr. Fausold said he believed that the high-school curriculum must become dynamic, and that pupils must be taught straight thinking on controversial issues. He contended that active materials must constitute the basis for a new curriculum and must include such topics as relation of capital and labor, collective bargaining, government ownership of utilities, human rights, production for profit, regimentation of workers, and development of government corporations to carry out the objectives of a planned economy. Vocational education of the future, he said, must extend through the junior-college level and the student must be trained to do one thing well. He must be able to think constructively and to adapt himself to changing conditions.

Mr. Vanderslice, in his talk, advocated the "whole education of the worker." He pointed out that in our present social, political, and economic world, men find themselves in novel and difficult situations. They cannot adjust themselves to those situations by formula or eliminate their troubles by dogma. He contended that the problem of co-operation does not demand glorification of any one group, but that it does call for courage to attack problems which in many schools have been forbidden. It demands that the mass of the workers study questions, gather facts, and form conclusions on controversial issues. In conclusion, he said that the vocational schools have done a fair job in developing trade technique, but they have done a poor job of giving the worker an education that will be of use in the human relationships that call for understanding, sympathy, co-operation, tolerance, and responsibility. These are the real needs for the next generation and their realization is the basis for the new emphasis on co-operation between the schools and industry.

Among those who spoke on industrial education and industrial-arts problems were Dr. James N. Rule, Harrisburg, Pa.; Dr. Edwin A. Lee, San Francisco, Calif.; Dr. C. F. Bauder, Philadelphia, Pa.; M. M. Proffitt, Washington, D. C.; William P. Lewis, Harrisburg, Pa.; Frank Cushman, Washington, D. C., and Dr. A. S. Hurrell, State College, Pa.

Problems of a pertinent character were discussed by speakers on the agricultural and home-economics programs. Dr. Edmund D. Brunner, of Columbia University, spoke on the subject, "New and Significant Aspects of the American Rural Society." He contended that agriculture is moving in new directions. He pointed out that the day of the common man has dawned and that the advantages of the AAA will not be surrendered without a struggle.

The home-economics problem attracted a number of state supervisors on Wednesday afternoon. Among the topics taken up were "Training in Money Management in the Home-Economics Program," "The Significance of the Consumer in Economic



Epsilon Pi Tau initiation and banquet held on December 7, 1934, in connection with the American Vocational Association convention at Pittsburgh

Adjustment," "Rural Home Economics for the Farm Girl and Homemaker," "Training Home Economics Teachers to Aid in the Solution of the Problem of Modern Youth." Among the speakers were Miss Rosamond C. Cook, Cincinnati, Ohio; Miss Ruth Freegard, Lansing, Mich.; Miss Flora Rose, Ithaca, N. Y.; Dr. Thyrsa W. Amos, Pittsburgh, Pa.; Miss Elizabeth Amery, Baltimore, Md.; Miss Edna P. Amidon, Washington, D. C., and Miss Adelaid S. Baylor, Washington, D. C.

Three commercial education meetings were held. The speakers talked on "Placement and Follow-up," "Methods of Training," and "Recent Changes in Commercial Occupations."

Speakers on the guidance program included John D. Beatty, Pittsburgh, Pa.; C. W. Sylvester, Baltimore, Md.; and Dr. W. H. Kilpatrick, Columbia University, New York City.

The programs of the part-time and rehabilitation groups were held separately in some cases, and in others were combined with the industrial-education or vocational guidance sections. Among the important speakers were George P. Hambrecht, Madison, Wis.; Dr. R. O. Small, Boston, Mass.; R. L. Cooley, Milwaukee, Wis., and Dr. W. J. Bogan, Chicago, Ill.

The national honorary professional fraternity in industrial-arts and vocational-industrial education, known as the Epsilon Pi Tau Fraternity, had an initiation which was in charge of Lawrence F. Ashley. The initiation was followed by a banquet at which Frank C. Moore, supervisor of industrial arts, Cleveland, was toastmaster. The speakers at this banquet were B. H. Van Oot, state director of vocational education, Richmond, Va.; Maris M. Proffitt, consultant and specialist in guidance and industrial education, Washington, D. C.; Orville E. Sink, professor industrial arts, Ball State Teachers College, Muncie, Ind.; C. E. Partch, dean of the College of Education, Rutgers University, New Brunswick, N. J., and others. After the banquet there was an informal round table on research and the 1935 Epsilon Pi Tau Review under the leadership of Dr. Wm. E. Warner, national secretary of Epsilon Pi Tau, Ohio State University, Columbus, Ohio.

The educational and commercial exhibits were an interesting feature of the convention. They occupied prominent places immediately adjoining the convention hall in which the general sessions were held.

At the business session, George P. Hambrecht, Madison, Wis., was elected president; H. A. Tiemann, Denver, Colo., R. L. Bynum, Nashville, Tenn., and Thomas H. Quigley, Atlanta, Ga., were elected vice-presidents; A. K. Getman, Albany, N. Y., Jacob

GEORGE P. HAMBRECHT
Newly elected president of the American Vocational Association

Spies, Sheboygan, Wis., Elizabeth Amery, Baltimore, Md., and R. W. Selvidge, Columbia, Mo., were returned to office for another term. Charles W. Sylvester, Baltimore, Md., was re-elected as treasurer of the association. Dr. Ray Fife, the retiring president, will continue on the executive committee as vice-president in charge of vocational guidance.

Chicago and Cincinnati are competing for the 1935 meeting of the association. Definite selection of the convention city will be made by a committee of three at a later date.

—*Theodore A. Siedle.*

WESTERN ARTS ASSOCIATION WILL MEET IN CHICAGO

Arrangements are being completed for the annual meeting of the Western Arts Association, to be held April 3 to 6, 1935, in Chicago. The organization came into existence in Chicago the year following the World Columbian Exposition in Chicago.

On April 3, 1935, the year following the Century of Progress Exposition, this Association is again scheduling to meet in Chicago.

The program for the Industrial-Arts sectional meetings follows. Wednesday, 2 p.m., Chairman, Dr. Louis Newkirk. Frank C. Moore will speak on "The Changing Curriculum of Industrial Arts," D. W. Castle on "Auto Mechanics as a Cultural Subject," LeVerne T. Ryder on "The National Home Craft Guild," and Robert B. Shumway on "Home Engineering for Girls."

Thursday, 9 a.m., an Address by A. B. Mays, followed by Dr. R. C. Woelner on "Drawing for the General Student," Julius Tarling on architectural drafting, and H. D. Campbell on machine drafting.

Friday, 9 a.m., Chairman, Robert Gregg. Roy R. VanDuzee will speak on "A.V.A. Study on Measurements," Dr. Louis Newkirk on "Industrial Arts in 1960," and John W. Higgins on "The Industrial Museum."

Saturday, 9 a.m., Alfred Howell, Chairman, will speak on "Curriculum Study in the Arts: A Summary of Problems and Possible Procedures." Robert Von Neumann will speak on fine and applied arts, Frank C. Moore on industrial arts, Henrietta W. Calvin on household arts, and Dr. William E. Warner on integration of the arts. There also will be a panel discussion.

ILLINOIS VOCATIONAL ASSOCIATION TO MEET IN CHAMPAIGN

Arrangements are being completed by the officers of the Illinois Vocational Association for the annual meeting of the Association, to be held April 19 to 20, in Champaign.

While the program is not complete at this time, invitations have been extended to a number of the national leaders in vocational education, who will give helpful talks at this gathering.

Among the features of the convention will be the competitive contest in connection with the exhibits of the various schools. Last year a trouble-shooting contest was held for students taking automotive mechanics. In addition, an arrangement has been made with the American Foundrymen's Association for a similar contest for students taking patternmaking.

The convention will hold two general luncheon meetings on Friday, in addition to a number of sectional meetings, and a banquet meeting on Friday evening. There will be two sessions on Saturday, one devoted to a general session, and a second to sectional and luncheon meetings.

Information about the program and the speakers may be obtained from Mr. D. F. Fultz, president of the association, Cicero, Illinois.

MILWAUKEE IS CHOSEN

The American Association for Adult Education will hold its national convention May 20 to 22 in Milwaukee. M. S. Dudgeon, head of the Milwaukee Public Library, is president, and Miss Marion Neprud of the Y.W.C.A. International, is secretary.

TEXAS INDUSTRIAL-ARTS TEACHERS MEET AT GALVESTON

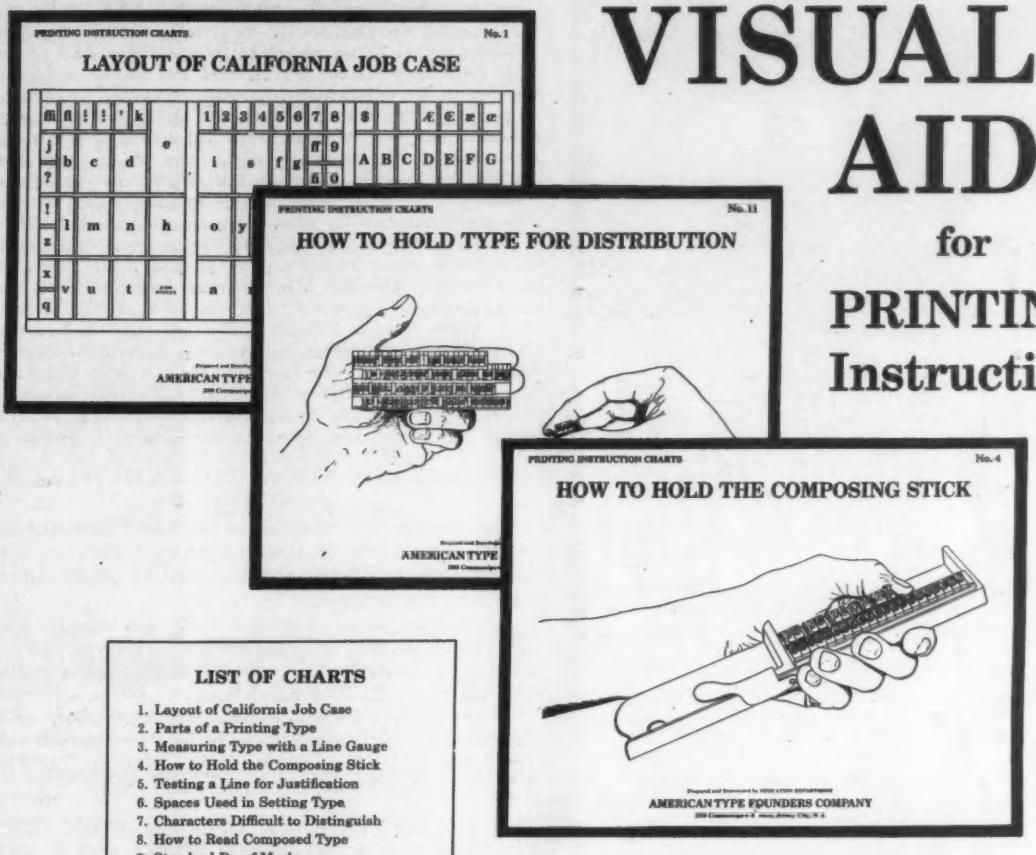
The industrial-arts teachers of Texas held their regular meeting November 29 to December 1, at Galveston, in connection with the state teachers' convention.

A half day's program was arranged in the form of a section for those interested in industrial education and industrial arts. A second half day was devoted to special problems related to industrial arts.

Two addresses given before the general session of the state convention were of particular interest to the practical-arts group. Dr. George W. Fraiser, of the Colorado Teachers' College, in his talk on "Bargains in Education," expressed astonishment at the policy of certain school boards who endanger a desirable part of the school program by false economy in restricting industrial-arts or home-economics subjects. Dr. Edwin A. Lee's talk on "Tomorrow's Children," aroused favorable comment.

The industrial education and trade and industrial sections held meetings in separate meeting places. Albert T. Krueger acted as

(Continued on page 8A)



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10. How to Empty a Stickful of Type
11. How to Hold Type for Distribution
12. Lining Type with a Rule
13. Styles and Faces of Type
14. Different Kinds of Indention
15. How to Piece Out Short Leads
16. How to Set a Stick for Short Measures
17. Proper Way to Place Type in the Stick
18. Picking Up a Line to Replace in the Stick for Correction
19. How to Tie Up a Page of Type
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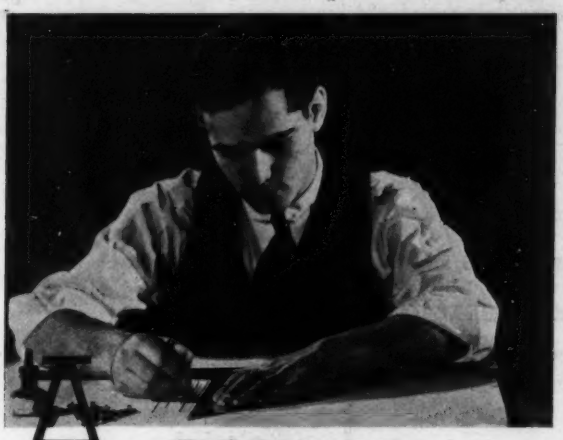

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(Continued from page 100)

chairman of the first group, and Colgate Elmer of the latter group.

Dr. Edwin Lee and State Superintendent L. A. Woods were the principal speakers at the vocational section. Mr. Woods pointed out that he was interested in providing a state program with major emphasis on the practical arts for 90 per cent of the children and emphasis on academic subjects for the remaining 10 per cent. Reports were received from the state directors which indicated that some successful work had been done in the state. There appeared to be considerable interest on the part of the smaller towns to utilize the diversified occupational plan of school extension in the upper grades of the secondary school. Attention also was directed to the work being done for crippled children.

Officers elected to head the 1935 activities follow: Industrial-Education Section: President, Ray Martin, Austin. Industrial-Arts Section: Chairman, J. B. Snodgrass, Danbury. Texas Vocational Association: President, Gladys Hundhal, Austin; Secretary, Prof. Victor Randel, Teachers College, Huntsville; First Vice-President, Wm. G. Behrens, San Antonio; Second Vice-President, Clara Marsle; Third Vice-President, M. J. Fields; and Fourth Vice-President, J. J. Brown. Vice-Presidents of this Society represent, respectively, the fields of Trades and Industries, Commerce, Agriculture, and Rehabilitation.—*Victor J. Smith.*

PEORIA INDUSTRIAL-EDUCATION CLUB MEETS

The monthly dinner meeting of the Peoria Industrial-Education Club was held on Monday evening, January 14, at the Enders Hotel, in Peoria. Approximately 35 members of the club were in attendance.

Mr. William Rapp, the speaker of the evening, gave a talk on "Pottery Making," tracing its history and giving a demonstration of modern methods used. A question period followed the talk.

At the business session, the following officers were elected for the next year: President, Dr. E. K. Frye; secretary, Mr. C. M. Hewitt, Bradley Institute, Peoria; treasurer, Mr. Floyd Lee, Pekin High School, Pekin, Ill.—*F. Barloga.*

DEPARTMENT OF VOCATIONAL EDUCATION OF THE N. E. A. TO MEET IN ATLANTIC CITY

The Department of Vocational Education of the National Education Association will hold its annual meeting on February 27, 1935, at Atlantic City, N. J., in connection with the meeting of the Department of Superintendence. Mr. Howard L. Briggs, Norris, Tenn., president of the association, will be in charge of the meeting. Charles W. Sylvester, Baltimore, Md., will act as secretary.

The topic for discussion will be "Vocational Education and the New Deal." Mr. C. S. Marsh, director of CCC educational work, will open the meeting with a talk on "Vocational Education and the CCC"; Dr. Floyd W. Reeves, Norris, Tenn., will follow with a talk on "Vocational Education and the TVA"; Mr. W. F. Patterson, secretary of the federal committee on apprentice training, will discuss "The NRA and the Program of Apprentice Training"; Mr. J. A. Linke, chief of the agricultural division, Department of the Interior, Washington, D. C., will give a talk on "Vocational Education and the AAA"; and Mr. Wesley A. O'Leary, Harrisburg, Pa., will present the summary of the discussions.

MEETING OF THE OREGON INDUSTRIAL-ARTS TEACHERS

The Industrial-Arts Section of the Oregon Teachers' Association, held its annual meeting December 28–30, in Portland.

The industrial-arts, vocational, and trade teachers held their joint meeting, with Frank Battaglia acting as chairman. Talks were given by Mr. McKenzie, of Portland, and Mr. Nouner. The section closed with the election of Mr. Allen, of Monmouth, as chairman, and Mr. Swanson, of Salem, as secretary, for the next year.

On Saturday morning, the industrial-arts section opened its meeting, with Mr. Pimentel, of Albany, as chairman, and Mr. Palmer, of Albany, as secretary. Mr. Getz gave a brief talk on

(Continued on page 10A)

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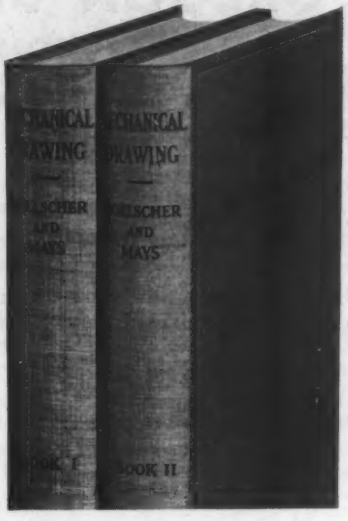

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(Continued from page 8A)

the meeting held in 1895 in Newport, at which there was an exhibit of projects by his classes. Mr. George Cox, of Oregon State College, and Mr. Whitney, of Portland, discussed the topic, "Manual and Industrial Arts in Correlation with Other Subjects."

The new chairman appointed the vice-chairman as editor of the industrial-arts section of the *Oregon Teachers' Journal* for the next year.

At the business session, Mr. Maurice Romeg, Hillsboro, was elected chairman; Mr. Bruce A. Mellis, Tillamook, vice-chairman; and Mr. Frank France, Corvallis, secretary.

At the annual luncheon, Mr. McClellan, of the American Screw Company, demonstrated a new self-centering screw and explained its advantages over previous types, and Mr. Johnson, of Eugene, explained the work of the Rifle Club sponsored by the Eugene public schools. — *Bruce A. Mellis.*

News Notes

Belgian Bureau of Student Exchange

The Belgian Bureau of Student Exchange, which is under the patronage of the Belgian Minister of Public Instruction, has for its object to promote intercourse, by correspondence or by visit, between students of Belgium and those of other countries in order that they may acquire knowledge of foreign countries.

Through the bureau, American students, either boys or girls, may be put into communication with Belgians of their own age, who will reply to letters in English by correspondence in French.

The bureau also undertakes to arrange exchange visits between students of both countries, each being received in the home of the other as a member of the family.

The bureau also arranges for the reception of American students, as paying guests at reasonable rates, in the homes of properly qualified Belgian families.

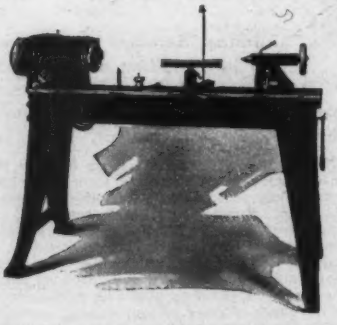
For further information letters may be directed to The Bureau Belge pour L'Exchange Estudiantin, 4 rue d'Italie, Huy, Belgium.

(Continued on page 15A)

SchoolShopEquipmentNews

NEW OLIVER NO. 139 SPEED LATHE

The Oliver Machinery Company, Grand Rapids, Mich., has just announced its new No. 139 motor-driven speed lathe, suitable especially for use in school or home shops where a dependable machine of this kind is needed.



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(Continued on page 11A)

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(Continued from page 10A)

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Complete information is available upon request.

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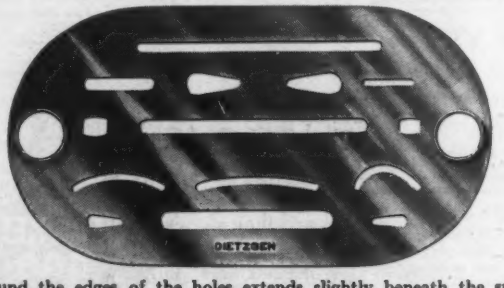
The Eugene Dietzgen Company, 2524 Sheffield Ave., Chicago, Ill., have just marketed a new improved erasing shield which the draftsman will like immensely. The erasing shield has two ⅜-in. holes punched at opposite ends of the shield. The metal



around the edges of the holes extends slightly beneath the surface of the erasing shield so that a natural resistance to motion of the shield is formed. Furthermore, the ⅜-in. holes are sufficiently large for the flesh of the fingers which hold the erasing shield to the paper to actually rest on the surface upon which the erasure is being made. The moving about of the shield, while making an erasure, is therefore entirely stopped.

The value of the erasing shield is further enhanced by the fact that it contains a large variety of different sized and shaped openings through which erasures may be made.

NEW PORTER-CABLE SANDER AND GRINDER

The Porter-Cable Machine Company, Syracuse, N. Y., is announcing its new Type B-12 bench-type sander and grinder.

The new sander and grinder, which is designed for rapid grind-

(Continued on page 13A)

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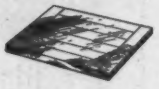

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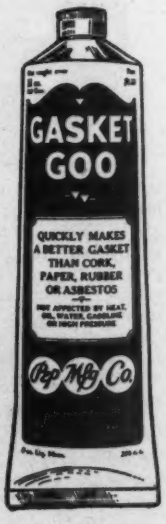

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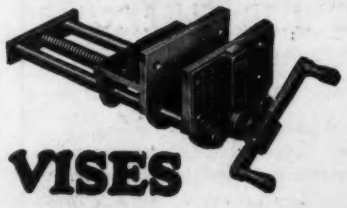

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BRUCE—MILWAUKEE

(Continued from page 11A)

ing and polishing of flat surfaces on wood, metal, composition materials, marble, slate and stone, has many advantages. Among them are increased production, saving of time, and adaptability to a wide range of jobs, and a substantial table base.

The machine is accurately constructed, though quite inexpensive. Motors of ½ or ¾ h.p. may be used on the motor base supplied. Belt speeds up to 4,000 ft. per minute may be secured on the abrasive belt by using the proper pulley on the drive shaft.

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DIXON OFFERS NEW TECHNICAL SERVICE TO TEACHERS

William Dixon, Inc., 34 East Kinney St., Newark, N. J., is offering a new technical service to teachers and school boards, through the establishment of an advisory committee on art-metal work.

The committee comprises Mr. Edward Thatcher, formerly instructor of decorative metal work and applied design in Teachers College, Columbia University; Mr. Frederick W. Landers, instructor of industrial arts and art metalcraft in public and normal schools, and Mr. Rudolph Schumacher, Jr., instructor of art-metal work in Haaren High School, New York City. The members of the committee are available for consultation service on information and technical aid in organizing art-metal departments in the high schools. The service is offered without cost or obligation to teachers interested in art-metal work.

A copy of the new 240-page Dixon catalog will be sent free to any teacher or school administrator upon request.

NEW CATALOG OF FINE CABINET WOODS

Albert Constantine and Son, Inc., 797 East 135th St., New York City, have issued a new catalog devoted to fine woods and wood craftsmanship. The catalog was compiled by Mr. Albert Constantine, Jr., assisted by Mr. Herman Hjorth, of Yonkers, N. Y., and is intended as a handbook for the use of the worker in the school and home shop.

The book contains some helpful information on the beauty of fine woods, the nature and use of veneers, and lists numerous kinds of inlays, cabinet woods, and carved moldings, and a full line of materials and supplies for use in the construction of fine projects.

A copy of the booklet will be sent to any shop instructor upon request.

BOOKLET OF WOODWORKING MODELS

The Remington Arms Company, Inc., Bridgeport, Conn., has issued a booklet, entitled *Things to Do With a Pocket Knife*, which gives many suggestions for the time-honored pastime of "whittlin'." There are many of the old tricks, such as chains, ball in cage, fans, etc., besides which there are descriptions of chip carving, making garden ornaments, linoleum-block carving, soft-wood carving, and relief carving. A copy of the book is available to shop instructors who are interested.

WOOD REFERENCE SET

The Woodcraft Supply Company, 166 West 74th St., Chicago, Ill., has placed on the market an inexpensive wood reference set consisting of fifty pieces (1/28 by 2½ by 5¼ in.) of fine woods, neatly labeled with common and scientific name, and origin and character of wood. Full description of this set may be obtained on request.

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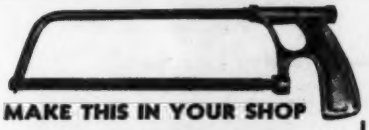

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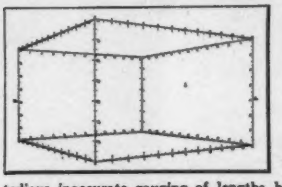

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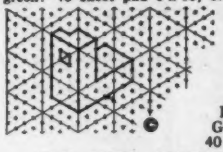

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(Continued from page 10A)

More Interest in Apprenticeship

Interest in apprenticeship in Michigan appears to be growing. Apprentices have been placed by the Building Trades School and by the Wilbur Wright Co-operative High School in Detroit. The Chevrolet course in Flint is progressing, and the Dow Chemical Company, of Midland, has established an apprentice course in its plant. Nine boys, graduates of the trade course, have been placed in Jackson.

Hobby Fair

The world's first community hobby monument was unveiled on October 5, at Federalsburg, Md., in connection with the fifth annual hobby fair. The hobby monument represents the growth of the hobby idea from the fair of 1930 with 32 entries to the fair of 1934 with more than 60 high-class entries of importance to merit state-wide interest. The idea has gained considerable influence in the community where more than 40 per cent of the people have hobbies of some sort.

Hobby Week at Hartford, Conn.

Nine schools in various parts of Hartford co-operated with the executive committee in the conduct of a hobby week at centers in which exhibits and demonstrations of hobbies were held during the week of October 29. A selected number of the exhibits were displayed in the Old State House.

New Courses at Stout Institute

Four new mathematics courses have been introduced at Stout Institute, Menomonie, Wis., in response to a new trend in science and the demand for work with instruments of precision in the subjects of physics, chemistry, and biology. This year a new course in calculus, called Mathematics IV, covering three units of work and credit, is being offered as an elective for the junior and senior men students. This course is in addition to new mathematics courses inaugurated two years ago for all students enrolled in the industrial education course.

A typical home workshop also has been established in one of the rooms of the Industrial Education Building. It was established as part of a movement for preparing industrial teachers to participate in the nation-wide program headed by the National home workshop guild.

Radio Program for Schools

The public schools of Dade County, Fla., in co-operation with the N.E.A., are sponsoring a radio program in connection with a nation-wide program which is being held simultaneously in all of the states of the Union. Each program is in charge of a chairman. School officials, principals, teachers, and citizens are co-operating in carrying the programs into operation.

Adopt Program of Expansion

The Future Farmers of America, meeting in their annual convention in Kansas City, in October, adopted plans for the expansion and improvement of the organization. The convention granted a charter to the Mississippi Association chapter, which brought the number of states participating to 47. The membership which now totals 82,000 has been attained within a six-year period.

Toyack chapter, Roosevelt, Utah, won the national chapter contest, with a prize of $300 for the most outstanding record of enterprise in the face of difficulties.

A total of 138 teams from 34 states competed in the judging of live stock, dairy, poultry, meat, and milk.

Of 74 boys applying for the highest degree, 58 were awarded the American Farmer Degree.

Exhibit American Contemporary Art

The Metropolitan Museum of Art, New York City, on November 6, held an exhibit of American industrial art, in connection with a private view for members of the museum. Collaborating designers and manufacturers included more than 200, all of whom were represented in the field of home furnishing.

The exhibit comprised industrial products, arranged in three major units and represented the work of twenty architectural and industrial designers. The entire exhibit was considered very successful in view of business conditions, and indicated an increased interest in contemporary design.

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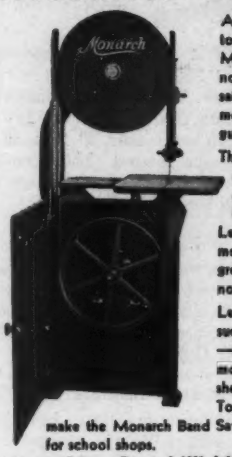

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